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COMPUTER POWER USER

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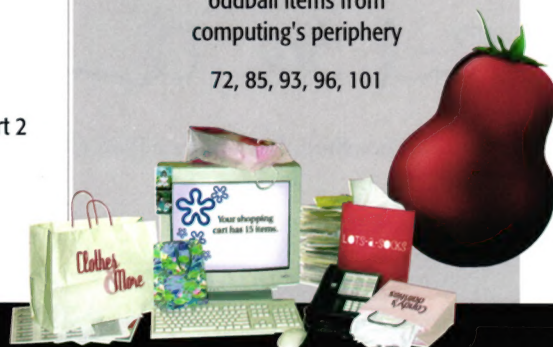
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GREETINGS FROM SAMITLAND

Happy birthday *CPU*,
happy birthday *CPU*,
happy biiirthdaaaay SeeeePeeeeeYooooo,
happy birthday to you.

Oh! Sorry, didn't see you there. Greetings! Well, it's *CPU*'s 1-year anniversary and we were just celebrating. But more importantly, I wanted to point out how you, the reader, have helped shape the magazine that's staring back at you right now. I think we're all better for it, so thank you to everyone who helped the magazine get through its first year.

We timed our holiday gift guide to give you more than a month to catch up on your shopping. Remember, there are some really good deals to be found online, so be sure to price-check retail products with the Web. Also check out page 62 for a shopping list; cut on the dotted line and hand it to your spouse. Hmmm, you might even want to photocopy it and hand it over to your primary gift givers as well. Every gift toward your new PC is sure to help.

Let's not forget our dreamy PCs (starting on page 46). We put together PCs for every budget and you're going to find a whole lot of loving in those seven pages. We've also compiled a list of some very cool games for the PC and top consoles starting on page 88.

And lest you think the holidays have gone to our heads, we've got some nice meaty articles on Microsoft's Palladium initiative (you requested it, so we're serving it up), Serial ATA, and distributed computing. Your monthly hardware review appetizers start on page 14. That's right, it's all good. Now dig in and let us know how you like it.

We'll be back a few days before Christmas Day with our January 2003 issue, so stay tuned for some sizzling items next month. In the meantime, please keep your feedback coming and I'll catch you back here same place, same time. Have a great Thanksgiving.

Samit G. Choudhuri

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Hours

Mon. - Fri: 8 a.m. to 8 p.m. (CST)
Sat.: 8 a.m. to 4 p.m. (CST)

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CORRECTIONS

There's An Athlon In Our Apple.

On the cover of our October issue, we stated that an Apple G4 case writer Brian Holmes gutted and modded had an Intel chip for its core. Shame on us! The G4 actually had an Athlon XP 2200+ as its foundation.



Gotcha.
Here it is.



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ATI Pushes Next-Gen Graphics DDR Spec

The DDR SDRAM fueling your new RADEON 9700 and similar high-end cards is approaching a 400MHz speed wall inherent in the memory. DDR-2, set to appear in products early next year, will start at 350 to 400MHz and scale up to roughly 550 to 600MHz, but even this revamp has troubles. (Some of the industry's first DDR-2 memory chips appear in the hand of ATI senior technology manager Michael Litt above.) DDR is essentially a desktop technology with a lot of architectural overhead unnecessary for strict graphics use.

ATI is now championing an optimized graphics memory spec called GDDR3, which will debut around the end of 2003 at 500MHz and eventually

extend up to approximately 800MHz. GDDR3 features new clocking and I/O mechanisms better suited to a point-to-point approach between the memory and graphics controller vs. the bus-slanted approach of DRAM.

ATI is busy gaining industry support for

GDDR3, and even arch graphics rival NVIDIA has indicated its support. However, GDDR3 is not going through the JEDEC standards body because the organization's lengthy review process would swamp the nine-month product cycle ATI and others are currently trying to maintain in advancing graphics technology generations.

Not all ATI news is about extending the high end, though. The company just released three

new R300-based cards: the Radeon 9500, 9500 Pro, and 9700, aimed at appealing to the "performance mainstream." The 9700 is a slightly slower (and \$100 cheaper) version of the famed 9700 Pro, offering a 275MHz engine clock against the Pro's 325MHz and a 540MHz memory clock instead of 620MHz. The 9500 (\$179) is also an AGP 8X and DX9-compatible part, complete with 64MB of DDR and four pixel pipelines. For \$20 more,

the 9500 Pro doubles both of these specs. Perhaps the best news tied to these recent releases is that the 8000-series products have plummeted in price. The Radeon 8500, considered mighty only nine months ago, is now extinct, so look for hot deals in the discontinued bins. The 64MB 8500LE lives on at only \$99 retail. ▲



The Best Burn Yet

If seconds matter when cranking out your music and data CDs, get ready for the next notch up in burner technology: 52X. New models from the likes of CenDyne and Lite-On (LTR-52246S) are now available that feature read and write-once times of up to 7,800KBps. (See our review of the CenDyne on page 21.) Both drives reach all the way to 24X rewriting, making them the fastest consumer burners in the world today. For frequent read requests, know that CenDyne specs out a 95ms access time while Lite-On does only 80ms. Naturally, the drives integrate buffer underrun protection, Mt. Rainier format writing, and all the other features you expect in the latest high-speed burners. ▲

Vinyl Revisited

If you're old enough to remember what a "B-side" is, you'll dig this: Verbatim has just released its Digital Vinyl CD-R product, a rugged, 80-minute disc that looks just like an old-fashioned 45 record, only a bit smaller. The dark color is obtained thanks to Verbatim's dark blue azo dye technology, and the reflective layer is double coated for extra protection. The retro gimmick may be just the ticket for getting analog-bound baby boomers to get on the CD-burning wagon.

Verbatim also touts how the vinyl look will be a hit with marketers looking to grab people's attention—a novelty we expect will wear off shortly after the holidays. Be prepared to pay a bit extra for the new, er, old look. Single discs run \$1.49, and a 10-pack is \$12.99. And no, these will not work in a record player, no matter which side you play. ▲



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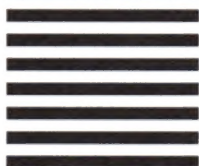
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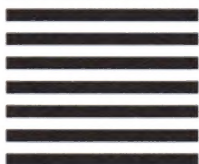
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One Server, Hold The Peripherals

Need a low-end, 1U server on your rack but don't have the space (or budget) for a monitor, mouse, and keyboard? MSI's new 9211 is a barebones, pizza box-shaped, Pentium 4-based server featuring a 16 x 2 LCD panel accompanied by Up, Next, and Enter buttons. Once you install the OS and configure the system, just unplug the peripherals and use the LCD to monitor and control everything from system posting and reboot to memory usage to setting the IP address. Based on the Intel 845E chipset, the 9211 sports one PCI-X slot, two hard drive bays, integrated RAID, dual LAN, and 10/100/1Gb Ethernet. Front panel controls are nothing new in high-end servers, but having the convenience in a sub-\$600 box ideal for firewalling or multimedia serving throughout a home is unprecedented. ▲



Look, Ma—no monitor or keyboard! MSI's inexpensive 9211 server lets you control essential server functions from a front-mounted LCD.

Hardware Mole

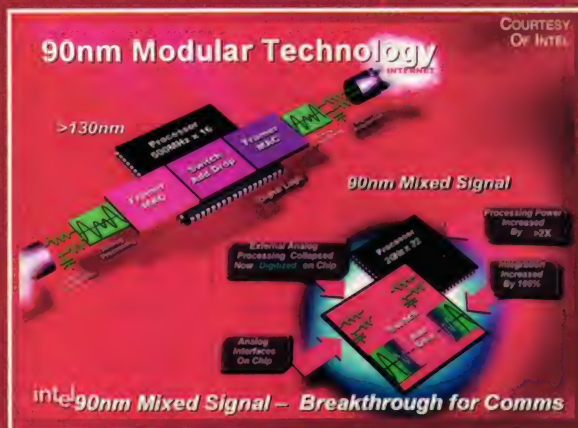
Our endearingly myopic hardware mole is always digging for the latest dirt in hardware. Here are a few choice nuggets he brought to light at press time.

Do You Have The Time, I Mean, Location?

In late September, Motorola announced its Motorola Instant GPS, a single-chip, assisted GPS system small enough to fit in one chip. The miniaturization necessary to achieve this resulted from collaboration with IBM and the use of Big Blue's silicon germanium technology. "IBM's technology enabled Motorola to reach its performance goal of detecting GPS signals so faint they'd be comparable to those received in Chicago from a light bulb burning in Korea," noted IBM's Walt Lange, associate director for foundry services, in a statement. With a complete GPS product now on one chip, devices such as wrist-watches that will reveal kids' whereabouts to parents and PDAs that can offer restaurant specials as you drive past them become feasible.

Getting Mixed Signals At 90nm

Convergence will soon hit silicon when Intel transitions from today's 130nm fab process into next year's 90nm logic designs. Traditionally, analog communications chips and digital processors were separated, but the shrink to 90nm coupled with the adoption of low-noise silicon-germanium transistors will mean 2.5 times as many transistors per chip and the ability to plant analog and digital transistors side-by-side on one processor. In theory, the advance could herald everything from single-chip cell phones to 802.11-enabled Pentium 5 CPUs.



Printer Hardball At Gartner Symposium

HP and Dell both used podium time at Gartner Symposium in October to perpetuate their printer bickerings. Recall that in July, Dell ended its agreement with HP to sell HP-branded printers and imaging products. HP CEO Carly Fiorina hinted that Dell was diving in over its head by pursuing its own printer line. She noted that Dell was "just a distribution channel, not a technology company" and that HP had invested more than \$900 million in developing its next printer generation. (Smack!) When his turn at the stand arrived,

Michael Dell fired back that Dell is much more than just a distribution channel, and he suggested that everyone look at www.dell.com/patents to examine the more than 750 technology patents his company owns. (Smack, smack! Admittedly, a quick look down Dell's patent list fails to show anything pertinent to printing technology.) He noted that Dell could do well in printers but would not elucidate on specific pricing or market strategies. No one has yet ruled out the possibility of HP manufacturing printers that are Dell-branded, so we'll wait to see if this friendly slapfest fades away or turns truly vicious.

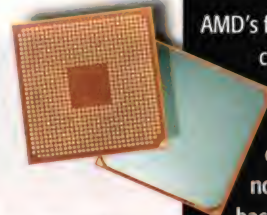
To continue the tradition established way back in July 2002, we bring you a page of the choicest chip news. Enjoy!

Consolidation Hits The Chips

Hitachi and Mitsubishi Electric, Japan's third- and fourth-largest chip manufacturers, have announced that they will combine more than 80% of their chip operations into a new company called Renesas Technology (Renesas is short for Renaissance Semiconductor for Advanced Solutions.) Starting operation in April 2003, Renesas is projected to immediately become the world's second-largest chip maker with a revenue target of roughly \$7.3 billion. Renesas will focus on producing microcontrollers, SRAM, flash memory, system-on-a-chip devices, and other discrete chips. Only DRAM is not expected from Renesas' domain. That product will be shifted over to Elpida Memory, a joint venture between Hitachi and NEC. Semiconductor numbers for Hitachi and Mitsubishi have been mauled during the tech slump as smaller vendors abroad have been able to move faster and operate on lower margins.

AMD Nailed By Mixed News

In case you had a blazing fast Hammer chip on your Christmas list, give Santa a break until next year. AMD recently announced that the fourth quarter debut of its next-gen desktop processor, Clawhammer, has been pushed back (again) to well into the second half of 2003. Not all AMD news is bad, though. The Athlon core upgrade from a 266MHz to a 333MHz FSB was similarly projected to be stalled until 1Q2003 but instead was formally released in the new 2700+ and 2800+ chips on Oct. 1. (See our review on page 18.)



AMD's forthcoming Hammer chips are still trying to claw their way to market. A fourth-quarter ship date has now been pushed back to the first or even second quarter of 2003.

Ain't Intel's Antipiracy LaGrande?

As major computer vendors each decide how they want to develop security measures as part of the Trusted Computing Platform Alliance (www.trustedcomputing.org), Intel is pursuing a security initiative code-named LaGrande. Although LaGrande is expected to help shield systems from viruses and hackers, it may also give copyright holders much greater control over how digital media is handled. According to Intel spokesman Daven Oswalt, LaGrande technology will reside in both the chipset and processor. Early press sources have indicated that LaGrande would debut in the Prescott, in the second half of 2003, but Oswalt says that the technology is two to three years from deployment. "LaGrande will help create a secure vault in your system offering something like an alarm system in your home," says Oswalt. "It will have a lot of TCPA architecture so that third parties will have to ask your permission in order to come into your home." TCPA specs are evolving on the software front in the form of Microsoft's Palladium (pg. 38).



When you're getting beat, join 'em. Hitachi and Mitsubishi

Electric have joined operations to form the world's second-largest chip manufacturer.

Watching The Chips Fall

Here's a rundown of the latest AMD and Intel CPU pricing information compared with initial release pricing.

CPU	Released	Original Price	Current Price	Last Month's Price
AMD Athlon XP 1600+	10/09/2001	\$160	\$55	\$60
AMD Athlon XP 1700+	10/09/2001	\$190	\$62	\$71
AMD Athlon XP 1800+	10/09/2001	\$252	\$73	\$78
AMD Athlon XP 1900+	11/05/2001	\$269	\$82	\$89
AMD Athlon XP 2000+	01/07/2002	\$339	\$93	\$99
AMD Athlon XP 2100+	03/13/2002	\$420	\$119	\$122
AMD Athlon XP 2200+, 0.13 micron	06/10/2002	\$241	\$147*	\$168
AMD Athlon XP 2400+	08/21/2002	\$193**	\$193**	\$193**
AMD Athlon XP 2600+	08/21/2002	\$297**	\$297**	\$297**
AMD Athlon XP 2700+, 333MHz FSB	pending Nov.	\$349**	\$349**	\$349**
AMD Athlon XP 2800+, 333MHz FSB	pending Nov.	\$397**	\$397**	\$397**
Intel Pentium 4 1.5 GHz	11/20/2000	\$819	\$106	\$111
Intel Pentium 4 1.6 GHz	04/23/2001	\$294	\$116	\$117
Intel Pentium 4 1.7 GHz	04/23/2001	\$352	\$123	\$125
Intel Pentium 4 1.8 GHz	07/02/2001	\$562	\$136	\$145
Intel Pentium 4 1.9 GHz	08/27/2001	\$375	\$157	\$164
Intel Pentium 4 2 GHz	08/27/2001	\$562	\$169	\$168
Intel Pentium 4 2.2 GHz	01/07/2002	\$562	\$195	\$199
Intel Pentium 4 2.4 GHz, 400MHz FSB	04/02/2002	\$562	\$185*	\$196
Intel Pentium 4 2.5 GHz, 400MHz FSB	08/26/2002	\$243**	\$248.48*	\$243**
Intel Pentium 4 2.6 GHz, 400MHz FSB	08/26/2002	\$401**	\$386*	\$401**
Intel Pentium 4 2.26 GHz, 533MHz FSB	05/06/2002	\$423	\$186*	\$198*
Intel Pentium 4 2.4 GHz, 533MHz FSB	05/06/2002	\$562	\$185*	\$198*
Intel Pentium 4 2.53 GHz, 533MHz FSB	05/06/2002	\$637	\$235*	\$242*
Intel Pentium 4 2.66 GHz, 533MHz FSB	08/26/2002	\$401**	\$374*	\$401**
Intel Pentium 4 2.8 GHz, 533MHz FSB	08/26/2002	\$508**	\$471*	\$508**

* Retail price.

** Manufacturer price per 1,000 units.

Other current prices, if indicated, are lowest OEM prices available through Pricegrabber.com.

321 Fights Backward Battle For DVD Copying

Byond the entertainment industry and those its vast lobbying coffers sway, there are few fans of the 1998 Digital Millennium Copyright Act. The DCMA makes any tool that circumvents copy prevention technologies illegal, a move that opens the door to eradicating the fair use laws we enjoyed throughout all the years of analog and CD-based media.

Few companies have been able to withstand the legal firestorm unleashed by the entertainment industry when piracy, or even potential piracy, issues are involved. This is why 321Studios, maker of DVD-to-CD app DVD Copy Plus (reviewed on page 70 of the August *CPU*), acted before the studios could sue it. In April 2002, 321 Studios

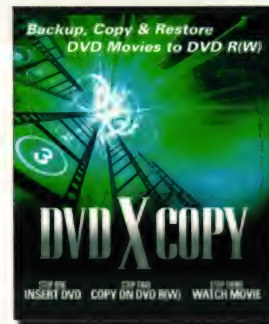
sued nine production companies that had allegedly threatened to sue the software maker. More importantly, 321's suit challenged the constitutionality of the DCMA.

The stakes were raised on Oct. 28 when 321 Studios began selling its new DVD X Copy application for \$99 online and through major retail sites. Movie dupes created with DVD Copy Plus suffered from a substantial loss of quality. Because DVD X Copy allows for burning to both -R(W) and +R(W) DVD media, copies are "bit-to-bit," meaning that no data is lost. Assuming that the source movie, like the recordable media, is a single-layer, 4.7GB disc, everything from the menus to the alternate audio tracks is preserved. (When

copying a dual-layer disc, the user can elect to ditch some of the extra material.)

DVD X Copy relies on the DeCSS decryption tool, which multiple courts have already determined to be illegal to distribute.

To date, the 321Studios suit remains unresolved, DVD X Copy works like a champ, and the MPAA (Motion Picture Association of America) has yet to unleash its reply. ▲



If 321 Studios is successful, its lawsuit to help keep DVD X Copy alive may help strike a serious blow against the Digital Millennium Copyright Act.

Microsoft's Shorts

Someone once observed that with unlimited time, a thousand monkeys, and a thousand typewriters, one of the monkeys would eventually type Shakespeare's "Hamlet." This month, a similar blip in statistical probability found all of our Software Shorts covering Microsoft. Any comparison between Microsoft and monkeys is purely accidental.

Microsoft Buys Liquid Patents

As long-ailing Liquid Audio prepares to merge with Alliance Entertainment, Microsoft has arranged to purchase numerous Liquid patents for \$7 million, including those dealing with digital rights management and the export of secure content to portable devices. Liquid will retain the right to continue using these technologies in its future digital distribution system. The acquisition puts another few arrows in Redmond's quiver as it continues the fight with RealNetworks for ownership of tomorrow's DRM and secure multimedia distribution markets.

Score One For Fair Use

The \$1,500-plus HP Media Center is a new consumer PC due by year's end that will use a new flavor of Windows called Windows XP Media Center Edition. The Media Center is meant to be a living room crossover machine, complete with TV tuner, remote control, and the ability to record shows. The plan was for the new Windows version to only let recorded programs be played back on the machine that recorded them. Fortunately, cooler Microsoft heads bowed to public pressure in October and agreed to modify the OS so that shows could be burned to DVD, sent over the Internet, and watched on console players. However, Media Center Edition will still support the Copy Generation Management System. Programs encoded with CGMS cannot be copied, but very few programs currently use the technology.



The Windows Media Player 9 beta has a lot of great features going for it, which is good because there's no uninstall feature.

The Sticky WM9 Upgrade

If you try out the Windows Media Player 9 beta from Microsoft and decide to uninstall it, steel yourself: There is no uninstall routine. Windows Me and XP users must fall back on the System Restore function to eliminate most parts of WM9. (Win98SE and 2000 users can use the Add/Remove Programs function in Control Panel.) Microsoft states that WM9 is really an OS upgrade, indicating yet another instance of Windows swelling to be all things for all people. In all fairness, Microsoft visited our office to give a hands-on demo of the software, and although we feel confident that just a teensy bit more (or perhaps less) planning could have made WM9 totally modular, the welcome improvements in WM9 leave us wondering why anyone would ever want to return to an older version.

Digital Download Day Crushed By Traffic

Three labels—BMG, EMI, and Warner—joined with distribution company OD2 and five retail partners to offer U.K. residents a one-week period in which to download top-name music for free. Visitors were issued a £5 voucher good for 500 credits. These credits were good toward streaming, downloading, and burning to CD, with more than 100,000 tracks from more than 6,000 artists available.

Even with outside nations barred from the weeklong event, Digital Download Day's (www.digitaldownloadday.com) retail partners were swamped with as many as 15,000 visits per hour, and several of our attempts to reach even the site's home page timed out. As we go to press, the free voucher offer is still up and running, although the effort has morphed into an introductory service promotion. You get the first month free with subsequent months costing £4.99, and file copying is not allowed. Ultimately, the service is much like Pressplay or MusicNet, but at least the weeklong promo's popularity sends a clear message to the recording industry that people are willing to download legal music tracks, too. ▲

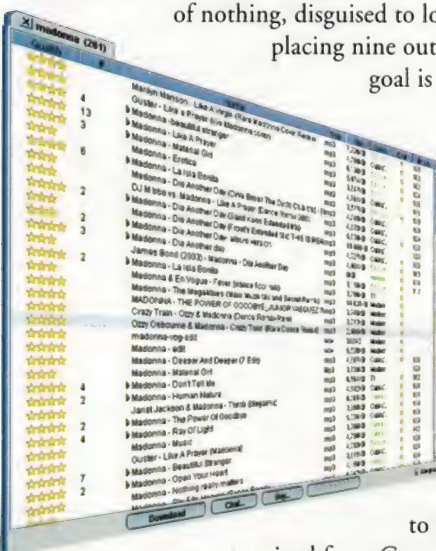


Music lovers in the United Kingdom had one week to get in on the DigitalDownloadDay give-away, if they could get into the promotion's swamped servers.

License To Sabotage

In late September, the RIAA appeared before Congress, asking for permission to continue its practice of flooding peer-to-peer file swapping services such as KaZaA and Morpheus with dummy music tracks. These are essentially multimegabyte tracks of nothing, disguised to look like music files. With some estimates now placing nine out of 10 P2P music files as decoys, the RIAA's goal is to make downloaders so fed up with wasting their time that they run out and buy the legal CD version. More likely, we expect

Can you spot the bogus Madonna files in this LimeWire list? Record companies are hoping you won't bother to try.



such tactics to result in waves of denial-of-service attacks against record labels and companies such as MediaDefender, which provides many of the industry's dummy files. Additionally, P2P

companies are upgrading their systems to help weed out "corrupt" files. No word has arrived from Congress yet on the RIAA's request. ▲

Ready For 3,900 Spams A Year?

Apparently, it takes a major research firm to figure out that spam messages will become even more frequent in the coming years. A recent Jupiter Research study reports that while the average 'Net user received 3.7 spam messages per day in 2001, that number now stands at 6.2. By 2007, more than 645 billion unsolicited messages will blanket the Internet annually, which averages out to more than 3,900 messages per person, or more than 10 per day. According to Jupiter, spam is a \$1.4 billion industry in 2002. By 2007, it will swell to \$8.3 billion, even though the number of actual email users will only increase from 104.5 million to 165.4 million. Let's hope that antispam utilities experience a similar explosion in use. ▲

Count Your Own:

Top 20 Cyber Security Holes Tallied

Apparently, after more than a year of introspection and lots of rhetoric about steeling America's IT infrastructure following the Sept. 11 attacks, Uncle Sam's systems are still rife with security holes. Presumably, so are those of many U.S. businesses. In October, the FBI and SANS Institute released its latest Top 20 List (www.sans.org/top20), divided into the 10 most common vulnerabilities under Windows and Unix systems. Not surprisingly, topping the Windows list is Microsoft IIS (Internet Information Services), followed by the likes of SQL Server and Internet Explorer. No. 1 on the Unix side is RPC (Remote Procedure Calls). In each case, the list details how to tell if your machine is vulnerable and supplies tools for patching it. ▲

The Line— Er, Chasm—Between Science & Humor

In a use of funding only slightly more profound than determining that spam will proliferate, Dr. Richard Wiseman and the British Association for the Advancement of Science have officially determined the world's funniest joke. (See www.laughlab.co.uk.) Ready?

“A couple of New Jersey hunters are out in the woods when one of them falls to the ground. He doesn't seem to be breathing, and his eyes are rolled back in his head. The other guy whips out his cell phone and calls the emergency services. He gasps to the operator: ‘My friend is dead! What can I do?’ The operator, in a calm soothing voice, says: ‘Just take it easy. I can help. First, let's make sure he's dead.’ There is a silence, then a shot is heard. The guy's voice comes back on the line. He says: ‘OK, now what?’”

This knee-slapper rose to the top of more than 40,000 jokes Internet users from around the world submitted. More than 2 million ratings were totaled during 12 months, and certain patterns emerged, indicating that different countries favored different types of jests. North Americans tend to favor jokes where people are made to look stupid, while those from the U.K., Australia, and New Zealand leaned toward jokes involving word play. Germans were found to laugh the most (no kidding!), and Scots fell over for jokes about death.

The ‘Net-based effort sought to shed light on the nature of humor, but an impromptu survey of professional comics ABCNEWS.com detailed shows that no one in entertainment seems to find the joke funny. Presumably, none of the comics polled contributed their own material to the study, and rumors abound that the RIAA is collaborating with the National Comedians Guild to digitally protect stand-up jokes from illegal retelling by audience members. ▲

Loose Strands On The Web

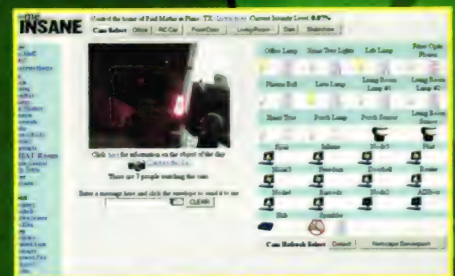
Looking for some new surfing destinations? Here are a few worthy sites you may have missed.

MIT Classes Sans Campus

What geek hasn't dreamed of attending the Massachusetts Institute of Technology, if only to sit in on a class or two? Now you can—virtually. MIT's new OpenCourseWare program (ocw.mit.edu/index.html) won't give you credit for classes, but you can freely download the professors' notes and other content for classes ranging from Laboratory in Software Engineering to Problems of Philosophy. More than 30 courses are offered during the current pilot, but the complete roster of roughly 2,000 classes is set to go online by 2007.

Beyond Voyeurism

Despite the challenge implied in the site name, www.drivemeinsane.com is more an experiment in home automation than a twisted psychology project. Paul Mathis has his home wired for remote control over the Internet—everything from lamps to the doorbell to the sprinkler. You may not be able to control your own life, but at least you can control a part of Paul's. You can rotate the cams and listen to certain areas, but not all options are available 24/7.



Want to mess with someone's life? Play with Paul Mathis' automated home from the comfort of your own desk.

All The News That's Not

Did you know that on May 8, 2045, Apple will release “the PiggyMac,” a bioengineered Macintosh computer embedded in a living, breathing piglet? If not, you're not getting your news from FutureFeedForward.com. The site began with half a dozen items back in September 2000 and has now grown to some 90-odd (mostly odd) news stories. If you want to learn about Microsoft's Web browsing handguns or Amazon.com's candidacy in the 2040 U.S. Senate run, look no further.



Yes, fiction can still be stranger than real life, even when it's fictitious news culled from the future.

BIOS Upgrades Available Online

Before you send another motherboard to the landfill, consider upgrading the BIOS and giving your PC a new outlook on life. Here are a few recently released upgrades. Check out www.cpumag.com/cpudec02/bios to see the entire upgrade list.

Manufacturer	File (No Date Available)	URL
ASUS	P4B533-E BIOS version 1009	download.asus.com.tw/mb_alllist.asp
ASUS	P4B533-M BIOS version 1010	download.asus.com.tw/mb_alllist.asp
ASUS	P4S533 BIOS version 1009	download.asus.com.tw/mb_alllist.asp
ASUS	P4B533 BIOS version 1011	download.asus.com.tw/mb_alllist.asp
ASUS	P4S533-E BIOS version 1006	download.asus.com.tw/mb_alllist.asp
ASUS	P4T533-C BIOS version 1008c	download.asus.com.tw/mb_alllist.asp

Compiled by Steve Smith

You Get PAID For That?

Software Design Engineer Microsoft

Hey hackers, want to work for the other side? Your title would be Software Design Engineer, but you'll really be running counter-intelligence for Microsoft's Xbox. Microsoft wants someone with a good knowledge of PC architecture, x86 assembler, cryptography, and, well, game hacking. You will be analyzing and reporting on "modification chips," which presumably refers to the quasi-underground, third-party mod chips that users solder into their consoles to beat copy-protection schemes. Not only will you review the security design for the console, but you'll help hack-proof subsequent runs of the Xbox with "hardware detection code fragments." ▲

RAW DATA

9.9 million

The number of Internet users ages 18 and older in the United States who access the Internet via mobile phone or PDA.

comScore

32%

The percentage of the estimated 7.3 billion email messages sent every day in 2002 that are spam.

The Radicati Group

4 million

The number of Americans looking for online job information on a typical day between March 1, 2002, and May 19, 2002.

Now Internet Project

The Ghost Of Dot-Coms Past



Think *your* workplace is strange? Check out some of the tales of dot-com excess, malfeasance, and outright debauchery filling local bookstore shelves now that castoffs from the good ship Web Revolution are telling their tales in print.

Imagine a time when the launch parties and industry luncheons were so plentiful that some dot-commies literally lived off of them, not bothering

to buy food for their own homes for weeks at a time. Or how about the mysterious executive in charge of Food.com, whose name never seemed to appear on the site but who lured one employee to the company by promising "you'll be rich within the year." Turns out the honcho was under indictment for fraud and a known associate of Vegas con men.

You'll find these and more legends of greed, corruption,

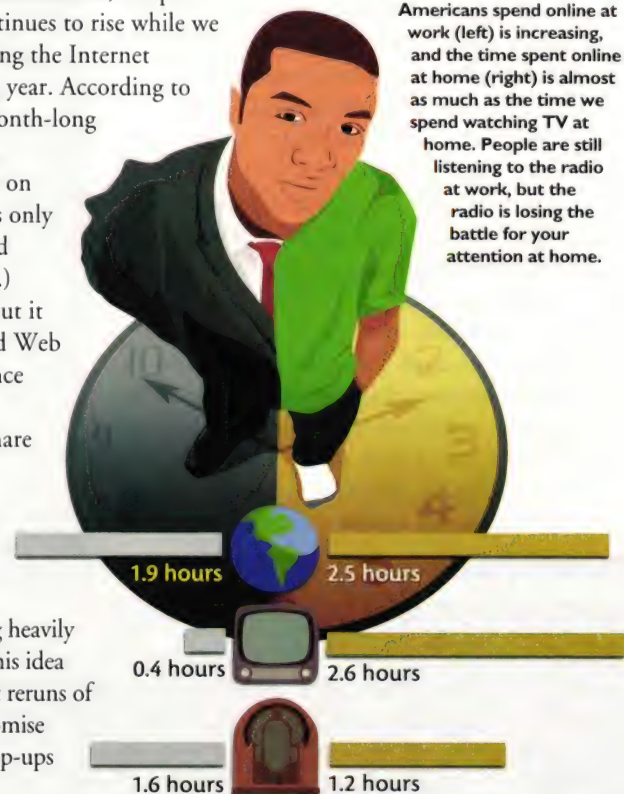
and downright self-delusion in the dishiest of the dot-com memoirs, "Inside the Cult of Kibu," by Lori Gottlieb and Jesse Jacobs. In addition to chronicling Gottlieb's life within doomed teen site Kibu.com, the authors gathered jaw-dropping tales of startup fever. Although the firings usually were as badly botched as the business models behind these companies, many of Gottlieb and Jacobs' contacts recount a lot of last-minute thievery in these over-funded, under-managed startups. Apparently more than a few oversized monitors, notebooks, Blackberries, and Aeron chairs left the building along with the laid-off workers.

Get Back To Work!

Is this a great country or what? By all accounts, the productivity of American workers continues to rise while we also spend more time and money surfing the Internet from the workplace with every passing year. According to online ad agency Avenue A's recent month-long survey of more than 3,000 Web users, Americans spend on average 1.9 hours on the Web from work each day, which is only about half an hour less than they spend with their TV sets at home. (See chart.) This may be bad news for your boss, but it sounds like good news to the depressed Web ad industry, which is hoping to convince its big-brand clients that ads on the Internet can grab eyeballs and mind share when television can't.

A number of major financial and news sites, such as CBS MarketWatch and NYTimes.com, are hoping to sell ad space the same way TV media does, with different rates for placement during heavily trafficked "day parts." Our take is that this idea only takes off when HBO decides to put reruns of "The Sopranos" on its Web site. We promise to pay more attention to banners and pop-ups if the Web gets a little more badda bing.

The number of hours Americans spend online at work (left) is increasing, and the time spent online at home (right) is almost as much as the time we spend watching TV at home. People are still listening to the radio at work, but the radio is losing the battle for your attention at home.



When Joysticks Go Bad



Holiday Wish List

1. A nickel from everyone who wants the same things.
2. Windows XP search puppy's head.
3. Microsoft to stop "improving" Windows; it is *DONE*.
4. Cell phone that doesn't break when I drop it (to avoid re-entering contacts).
5. Cell phone that restores my contact list.
6. Dangling hands-free earpiece/mic with "in use" lights to differentiate between people engaged in a cell phone conversation and deranged vagrants talking to themselves.
7. Etiquette book for people who use their Blackberries during business meetings.
8. Expansion cartridges on my PC for easy upgrading.
9. Quality video chip, gamepad, and TV-out as standard features on PCs.
10. A product that lets me retaliate against spammers.

One would generally think that software engineering was a relatively safe occupation, barring the very rare life-threatening case of carpal tunnel syndrome or the occasions on which a talented engineer is buried beneath a collapsed tower of Mountain Dew cans and dies of caffeine deprivation before anybody can dig them out.

It is thus fair to say that most engineers take their personal safety and well-being for granted in the software development business and proceed from day to day on the general assumption that no bodily harm will come to them. I was such an engineer at the time that I first came into contact with the budding and exciting new field of force feedback input devices. It all began when a very small west coast company approached me with a prototype for the first force feedback joystick. The company in question had been in the business of robotics research, largely funded by the U.S. government, and had secured several patents in the area of force feedback technologies. They wanted to sell the technology to Microsoft but had difficulty getting a meeting with the joystick group. I told them to show me what they had and I'd see what I could do.

The device they brought to the meeting looked very much like half a bowling ball with a handle. It weighed nearly 20 pounds and had to warm up before the handle came to life and began to move of its own volition. They warned me not to touch the device, saying it was just a prototype and was somewhat fragile, although in retrospect I think it was my "fragility" they were worried about. They proceeded to show me a video they had made that one might have mistaken for a 1950s defense department documentary on top-secret military research, the highlight of which was a very slight Asian woman dressed in what can only be described as the latest Sigourney Weaver robot body wear. She had her hand inserted in the electronic sheath of a giant robotic crane-like arm that she was using to crush empty 55-gallon drums and then toss them over her shoulder like empty beer cans. I vaguely recall that my first response was an astounded "Is that for real?" "Yes," came the response.

Now what self-respecting nerd wouldn't be excited at this point? I introduced them to the joystick group and after showing the technology to my friends responsible for building DirectX, we immediately began to design a Force feedback joystick API for DirectX. Naturally, it would be important to have a demo of what force feedback would add to video games, so I began work on adding force feedback support to the very first DirectX game ever created, Doom. (Ultima Online was #2.) The first Force feedback demo we built added a kick to the Doom shotgun and a

machine gun rattle to the Doom chain gun. There was a problem, however: The "prototype" joystick was indeed a close technology relative of the 55-gallon-drum-crushing robot hand.

The first person in the game industry

that I am aware of to be honored with a serious force-feedback-induced injury was Jay Wilbur, then President of id Software (now at Unreal). Jay was visiting me at Microsoft and naturally, I was most excited to show him what we had done with id's crown jewel game. Jay made the mistake of reaching for the joystick before it had very forcefully calibrated itself and received a rap on the knuckles that left his hand packed in ice for the duration of the meeting. Needless to say, some of his initial enthusiasm for force feedback was muted.

My more serious injuries occurred on stage as I was demoing the technology to a large audience and the game crashed, causing the joystick to go berserk in my hands. The audience found the sight of me wrestling with a giant twitching joystick very amusing, and once the bruises healed, I reluctantly came to appreciate the experience from their point of view. A much subdued implementation of this technology can now be found in the modern Sidewinder Joystick, although I'm still prone to flinch when I touch one. ■

The first person in the game industry that I am aware of to be honored with a serious force-feedback-induced injury was Jay Wilbur, then president of id Software.

Send those holiday thoughts to
TheSaint@cpumag.com.

EXTREME HARDWARE

These Gizmos Don't Sing It, They Bring It

This month's Extreme Hardware selection gives the proverbial envelope stretch marks. Everything seems to be growing out of control. For example, Kodak's digital camera megapixel count is skyrocketing, challenging Totoku to keep up with ever-larger LCDs. Y'all are gonna need major storage for all those digital photo pixels, but Maxtor's new MaXLine II drives have you covered. Ironically, the biggest beast of them all has been shrunk to just eight inches tall in time for the holidays. Go, go, Firewire Dino!

by Marty Sems



Firewire Dino

"Oh, no . . . there goes Tokyo." Awaken your slumbering Blue Oyster Cult eight-tracks and unleash this hellspawn on your desktop. Firewire Dino (\$74.95; www.charismac.com; changed from Hubzilla at press time because of copyright issues) is the most menacing four-port FireWire hub the Orient has ever produced. His eyes light up red and his mouth glows blue during use. (We hear radioactive breath can do that to you.) Stomp on over to CharisMac's site, as it's more entertaining than anything we can write here. Dino should be available in limited quantities by the time you read this. Just try to forget Godzooky, the fat, bumbling nephew in Chuck Taylors from the Saturday morning cartoon.



RoombaVac

"Protocol? I don't need a protocol-droid." So much for C-3PO. "Danger, Will Robinson!" No, thanks, B9 Robot; we already have a neurotic cowdog for an early warning system. Maybe R2-D2 acting as a rolling wet bar in "Return Of The Jedi" came closest to a robot with a real-world use—until now. iRobot's Roomba Intelligent FloorVac (\$199.95; www.roombavac.com) can vacuum a room in a spiral pattern, automatically sensing obstacles and avoiding falling down stairs. It has a 60- to 90-minute rechargeable battery life and 15.3 cubic inches of vacuum bin space. It's a perfect fit with our attitude toward housework. Suggestions would be appreciated on how to get the cowdog to come back out of hiding, though.

Kodak DCS Pro 14n

It is a time for resolution: We must make our photos absolutely clear, leaving no ambiguity as to who that guy in the third row of the wedding party is. Kodak Professional is doing its duty with a new 13.8-megapixel digital camera called the DCS Pro 14n (estimated price less than \$4,000; www.kodak.com/go/professional). The DCS Pro 14n uses Nikon SLR lenses—even wide-angle ones—and a big 24mm x 36mm CMOS sensor with a 4,536 x 3,024 resolution. Meanwhile, Kodak's DCS Pro Back 645H (\$11,995) converts Hasselblad's new H1 film cameras to 16-megapixel digital units. In a sign of things to come, Kodak collaborated with Swiss company Sinar AG on an incredible 22-megapixel CCD image sensor for the large-format professional photo market. Somehow we doubt you'll want such detailed photos of certain members of the family. Airbrush as needed.



Maxtor MaxLine II 320GB

Maxtor has boldly gone where no one has gone before with a third of a terabyte in a single hard drive. The company's MaXLine II line of premium EIDE drives tops out with a four-platter, 320GB cruiser (\$459; www.maxtor.com). MaXLine drives are only available in new servers and near-line storage devices, but this 320GB vessel already has (drive) space buffs Tribbling all over themselves. You could store full DVD-quality versions of the "Star Trek" movie series seven times over and still have room for all your Leonard Nimoy MP3s. It would be a 5-year mission for a typical user to max out this enterprising drive. The drive is designed to live long—it has a 1 million-hour MTBF—so your server can prosper. It will beam in by year's end in UltraATA/133 form and early next year in Serial ATA. There's also a newly commissioned 7,200rpm 250GB MaXLine Plus II (\$379) in the fleet, so trek on over to Maxtor's site for more information.



Totoku CCL901

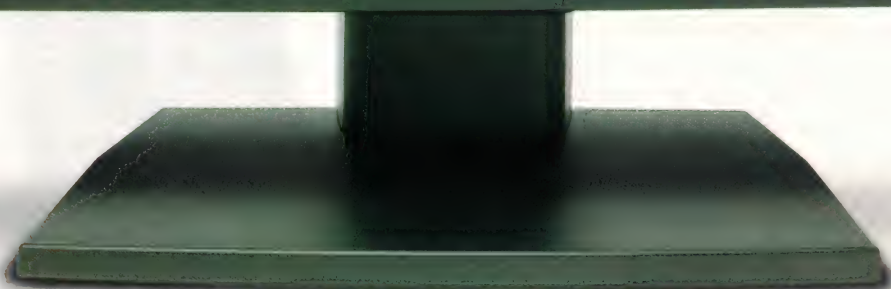
LCD just got high-res at Totoku (www.totoku.com). You no longer have to give up jimgongous resolutions to get a flat-panel display. Totoku's 22.2-inch CCL901 has a maximum resolution of 3,840 x 2,400 at 24-bit color, which works out to about 9.2 megapixels and 200dpi. The company says this single- or dual-DVI LCD has a native gamma of 1.8 and 500-Kelvin backlights, which we sincerely hope means something to Photoshop lovers out there. The CCL901 comes with its own DVI display adapter for an overall cost of \$8,995. Torque Systems (www.torque.com) is a Totoku reseller here in the States, so direct your inquiries thataway. The Totoku CCL901: It's big, it's bold, it's beautiful.



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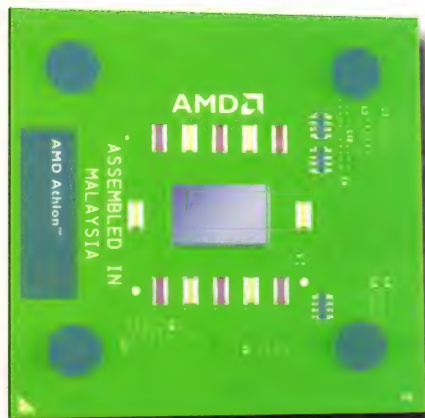
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NEC ranked as the #1 flat panel monitor branded vendor in the Stanford Resource – iSuppli Flat Panel Monitor Quarterly Report, Q2 '01. MultiSync is a registered trademark, and Ambix, XtraView+, OmniColor and LiquidView are trademarks of NEC-Mitsubishi Electronics Display of America, Inc.

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AMD Athlon XP 2700+ & 2800+



Athlon XP 2700+ & 2800+

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AMD

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It's not been the best of times for AMD this year. What started out so promising with the company ahead of Intel in terms of price and performance is finishing on a rather sour note. Poor Q3 earnings (as in losses), a stock price below \$5, the delay of Hammer, the loss of the performance crown to Intel's P4, and a couple of paper releases in the Athlon XP 2400+/2600+ later, and it's not looking too clever for the boys in green. Every action deserves a reaction, and even dedicated followers of AMD have voiced their concerns, in particular about that last point. Nonetheless, with the next-gen Hammer delayed into next year, the only thing left to do is update the Athlon XP line once more, and this time it comes in the size and shape of the 2700+ and 2800+.

Running the nomenclature through our patent pending "marketing tosh" meter (which now includes the microcode update for the newer Thoroughbred-B cores), we get readings that translate to 13 x 166MHz, aka 2.17GHz for the 2700+ and 13.5 x 166MHz, aka 2.25GHz for the 2800+. Now our consumer novice chum, Uncle Albert, who you have to feel sorry for (having to buy a new CPU every month for little Johnny), will know what's going on. Heat dissipation tops out at 75.3 watts for the 2800+ and 68.3 watts for the 2700+ with the core voltage still being 1.65 volts. Just to reiterate, the Thoroughbred-B core stems from a 0.13-micron process on an 84mm² die size, comes with nine metal layers and 37.6 million transistors and 384KB of total cache, and is manufactured at FAB30 in Dresden.

These new Athlons are not exactly the same as previous models. But before you jump around exclaiming, "Barton is here," settle back down because the only update this time around is support for a 333MHz (166 x 2) frontside bus.

Although current Athlon XP owners with older platforms might have some luck through "unofficial" 333MHz FSB options with overclocking, it's probably best to start with a clean slate and go for

either NVIDIA nForce2 or VIA KT400 solutions. Don't expect miracles in terms of performance just yet, even with a 25% increase in FSB, but improvements will be possible later on with higher frequencies, so we'll take it for now.

Running your system synchronously with DDR333 memory will now be possible, which is very beneficial in terms of reducing memory latency. The added available bandwidth of 2.6GBps (up from 2.1GBps with 266MHz FSB processors) with 333MHz FSBs is groovy, too. Because the nForce2 is capable of running dual-channel DDR400, a 400MHz FSB Athlon XP is likely in the cards later. But for now, using dual DDR333 with an nForce2 seems to be a very viable option with a maximum of 6.4GBps worth of bandwidth. In some cases, the aforementioned setup is good for as much as a 20% performance jump over the Athlon XP 2600+ as opposed to 5% to 6% with a VIA KT333. This is dependent upon the applications you use, of course, preferably bandwidth-intensive ones.

The new 2800+ really does bridge the gap once again, and in some instances, AMD has taken the performance crown back again, for now. But there are a few hidden agendas going on. You can't actually buy either of these two new processors, and they won't be readily available. The 2700+ is due for a rollout sometime in Q4 of 2002 and the 2800+ only in Q1 of 2003. A few select OEMs will be selling 2700+/2800+-based systems before then, but that doesn't help the avid DIY CPU reader much. Add into the mix that NVIDIA's nForce2 is still in beta, and that also means that the optimal platform also isn't quite ready for prime time.

Then there are the boys in blue at Intel, who are putting the finishing touches on their 3.06GHz HyperThreading P4s, which will come out before the new Athlons are widely available. Oops. Still, upping the FSB is a step in the right direction, but upping the cache a la "Barton" core to 512KB would also bring fruits for us gamers. In the meantime, AMD is staying very competitive, at least on paper, with Intel. Pricing for the 2700+ is set for \$347 and \$397 for the 2800+ in quantities of \$1,000. First person to buy 1,000 CPUs gets a free pint of Boddingtons. ▲

by Alex "Sharky" Ross

The 2700+ & 2800+ Join The Fray

*Tested on a WinXP Pro

	Athlon XP 2800+	Athlon XP 2700+	Athlon XP 2600+	Pentium 4 2.8GHz
3DMark 2001 default	12052	11920	11795	12823
PCMark 2002 CPU Test	6668	6589	6289	6890
Quake III	327	317	286	351
Comanche 4 default	53	52	50	57
Serious Sam TSE	115	114	112	112

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

ATI All-In-Wonder Radeon 9700 Pro

One of this year's most talked-about events was ATI's release of the R300 chip product in the form of the Radeon 9700 Pro. For the first time in yonks, the performance crown shifted from Santa Clara's NVIDIA to ATI in Toronto. Having played with that card for a while now (reviewed on page 20 of the October *CPU*) and being present at another "behind-closed-doors" preview, the cat can now come firmly out of the bag on another product that is possibly even more intriguing, from the same people who brought you the All-In-Wonder 8500. The previous All-In-Wonder proved to be the best in its class upon release, and the same holds true today. But because every other segment, including mobile, desktop, and value, have been updated this year, it's time for the All-In-Wonder line to get gentrified with the All-In-Wonder 9700 Pro.

So it's out with the R200 and in with the DX9-class R300 chip, incidentally clocked at the same 325MHz speed as the 9700 Pro (it's top of the line here, folks) and also with the same 128MB of 620MHz DDR configuration. This obviously improves 3D gaming performance from "pretty good" to "top of the class." This is certainly a step in the right direction because in the past, end users who wanted All-In-Wonder features would have to suffer the consequences of inferior 3D gaming performance.

Also new to the package is a single chip solution encompassing analog video and audio processing on the Theater 200 chip, which replaces the older Rage Theater 1 and Micronas stereo decoder. Video has been improved, thanks to a new 2D comb filter. A 12-bit ADC (analog-to-digital converter) is used instead of a 9-bit ADC this time around. Thus playback and capturing of video and audio signals is superior in quality with fewer artifacts.

In addition to SmartShader, FullStream, and SmoothVision 2.0, all part of the vanilla 9700 Pro, a new feature called VideoSoap has been added. Using filters, the R300 chip's pixel shaders are utilized to reduce TV signal interference/noise during recording: very smart indeed. The Cobra MPEG-2 engine ATI uses offers not only MPEG-2 decoding for watching DVDs but also encoding (a first),

offloading functions from the CPU onto the R300. Component video is supported within the R300, and so component outputs supporting 480i, 480p, 720p, and 1080i are all available via a cable dongle for your HDTV viewing pleasure.

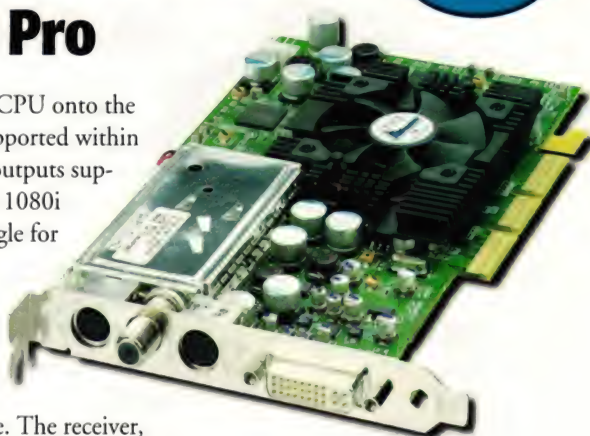
Included in the package is a new RF remote control, letting you control not only video/audio but also your entire PC, including the mouse. The receiver, which uses RF instead of infrared this time, connects via a USB port. For all you geek-romantics, just think about the possibilities: Bring your date home, turn on the music, and put on a screen saver (or the Hamster Dance) all without actually touching your PC.

The software suite has been buffed up with Multimedia Center 8.0, which provides functional suites for TV, DVD, VCD, CD, and Genstar Guide +. Aesthetically, it has been improved, but the added bonus of alpha blended video (called ThruView) means you transparently watch TV while you work. MultView lets you display two independent TV signals simultaneously, as well as the picture-in-picture-like functions pricey TVs boast.

So, do you really need a card that does it all? If you've ever owned a Swiss army knife, you'll catch my drift here. Sure, you probably won't need to use scissors, toothpick, and bottle opener all on the same date, but it sure beats packing all that gear as separates. So unless you plan on having multiple PCs, one for gaming, one for work, one for video editing, and one for TIVO/VIVO, the All-In-Wonder 9700 Pro really is a useful blighter indeed.

What's not to like? Oh, the price, which is going to be around five hundred smackers! So if it's going to be a present, be sure it's for someone really important, like yourself. In terms of competition, right now there isn't any. NV30 isn't out yet, and it'll be some time after that before a Personal Cinema Product with similar features comes out. Matrox's Parhelia-based eTV solution is also on the horizon but will not be in the same league in terms of 3D gaming. ▲

by Alex "Sharky" Ross



All-In-Wonder Radeon 9700 Pro

\$500

ATI

(905) 882-2600

www.ati.com

Preview: No Rating



The RF remote control that comes with the All-In-Wonder 9700 Pro even lets you control your mouse without moving from the couch.

Intel D845PEBT2

The D845PEBT2 mainboard based on the new Intel 845PE chipset supports DDR333 as well as HyperThreading and will be used as a launching platform for the new HT P4s. The 845PE will likely be a popular choice with enthusiasts once other OEMs clear out their 845E/G inventories and subsequently release 845PE boards.

The code-named "Blue Mountain 2" D845PEBT2 board is packed with features, including support for Serial ATA. Intel chose the popular Silicon Image 3112 controller, allowing for RAID 0 or RAID 1 or, of course, two independent Serial ATA devices. The Analog Devices SoundMAX AD1980 chip provides on-board

sound, allowing decent enough six-channel audio. On-board 10/100 LAN is integrated into the ICH4 south bridge. The board comes with Lucent's FW323 controller, and there are I/O ports aplenty, with four USB 2.0, a LAN, FireWire, GamePort, two PS/2, serial, parallel, and six-channel audio (including two digital outs).

Intel uses its own BIOS, which is a little more restrictive than is normally the case with "enthusiast" boards. The only tweakable option worthwhile in there is for your DRAM settings for CAS latency, but you can't change the voltage or even make FSB adjustments. Boo. That last point will put off real enthusiasts who like a greater level of control and tweakability, so clearly Intel has some work to do before getting it right. But for \$140, what you do get is Intel's best attempt yet at a loaded mainboard. The fact that it's Intel may appeal to those of you interested in stability, as well. ▲

by Alex "Sharky" Ross

D845PEBT2

\$140
Intel
(408) 765-8080
(916) 377-7000



Chipset Benchmarks

*Tested on a WinXP Pro P4 2.53GHz

	i845PE DDR333	i845G DDR333	i850E PC1066	VIAP4X333 DDR333	SiS 645 DDR333
3DMark 2001 default	11109	11057	11435	11256	10894
Quake III	291	287	309	298	284
Jedi Knight II	112	110	115	112	108
Comanche 4 default	47	47	51	47	46

Intel Celeron 2GHz

While we sit and wait for Intel's Pentium 4 HyperThreading-enabled 3.06GHz CPU, the company has just released a value-targeted processor that cracks the 2GHz barrier. The Celeron 2GHz for the first time features the Northwood core, as the older Willamette core is now finally put to rest.

This also means that a die-shrink has occurred from 0.18-micron down to 0.13-micron. The architecture remains mostly the same, with a 100MHz quad-pumped FSB providing up to 3.2GBps of maximum bandwidth.

Obviously we're not in Pentium 4 533MHz FSB territory here, but then again, this is a value-aimed processor. The same 128KB of L2 cache is used, and the core still features SSE2, Rapid Execution engine, and Instruction trace cache. Obviously with the P4 harboring 512KB of L2 cache, performance suffers significantly with a Celeron, even at 2GHz. The processor is socket 478-based, which means you can use any of the P4 platforms when considering a motherboard, but due to the limited FSB, there probably isn't

any need to go for newer 845PE boards that support DDR333 unless you are an enthusiast. OEMs trying to keep the price down will most likely use DDR266. Overclocking the new Celeron up to 2.5+GHz is as easy as ever, as long as you stay away from Intel boards that don't offer any Vcore and FSB tweaking options.

With AMD dropping its value-aimed Duron line of processors, Intel is left without too much stern competition, although the more savvy OEMs could look at the price differential between Celerons and Athlon XPs and choose the latter for better performance. Either way, OEMs can now slot a low-price Celeron-based system into their lineups, should they choose to do so. And they usually do, despite the fact that entry-level Athlon XPs perform better and are cheaper to boot. This industry often doesn't make sense. In 1,000-unit quantities, the 2GHz Celeron processor is priced at \$103. Serious gamers need NOT apply. ▲

by Alex "Sharky" Ross

Celeron 2GHz

\$103
Intel
(408) 765-8080
(916) 377-7000



CenDyne Lightning V ReWriter 52X/24X/52X

Everybody wants a peek at Lite-On's 52X/24X/52X LTR-52246S CD-RW, so when this CenDyne-branded version of the drive arrived a few hours ago, pub editor Samit "Tougher Bezel" Choudhuri put it on the fast track. Two things emerged during the hardware test session. The first is that the Lightning V played nice with our WinXP Pro test system the first time around, something many other drives couldn't do. The other thing is that this is the fastest burner I've seen so far for CD-Rs, and the second fastest for CD-RWs. (Yamaha's CRW-F1 beats it by a minute.)

We spun up this CenDyne in our designated optical drive test system, with which we suffer a love-hate relationship. It's a 667MHz PIII with 384MB of SDRAM and WinXP Pro. In this finicky IBM box, the Lightning V burned an entire 700MB folder of mixed data files in 2:27 (minutes:seconds)—a new record. Its 4:48 time burning 639MB to appropriately rated

CD-RW is also very good, although it can't even spit on the race-winning Yamaha's back.

The official results from the average of five passes with CD Tach version 2.05 included an average read rate of 5,328KBps and a maximum of 7,296KBps, along with 77ms random and 148ms full-stroke access times. However, a slightly slower first pass jaded the results, which is a reversal from the usual fortunes of drives WinXP doesn't like. Typically, drives start out well during the first pass, then nosedive as WinXP cuts off DMA support for whatever reason. In any case, it's worth noting that during the last four of the five passes, this CenDyne averaged about 5,520KBps reading and maxed out at about 7,520KBps.

CenDyne didn't claim Mt. Rainier support in our test unit's docs, but the drive's manufacturer, Lite-On, does. What's not to like? ▲



Lightning V ReWriter 52X/24X/52X

\$129
CenDyne
(714) 556-1020
www.cendyne.com



by Marty Sems

Sony DRX-120L DVD+RW 2.4X/2.4X/8X

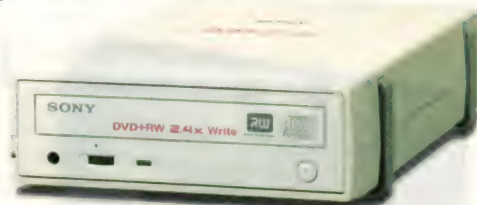
Sony just released a breakthrough 4X DVD-R/2X DVD-RW/2.4X DVD+R/RW combo drive (DRU-500A; about \$350) shortly before this was written, bridging the compatibility gap between the two standards. The new drive's external version, the DRX-500UL costs about \$430 and supports both i.LINK (FireWire) and USB 2.0. But both drives seriously overshadow the \$599.99 DRX-120L that's been waiting patiently for me to review for some time now. My bad.

The DRX-120L emerged during a spate of DVD+RW drives based on a 2.4X/2.4X/8X mechanism. It's a FireWire version of the DRU-120A (\$449.99) I reviewed a while back. It doubles as a 12X/10X/32X CD-RW, as do Sony's new DVD+RW/DVD-RWs. Wraparound rubber pads cushion the sides of the drive's beige enclosure and keep it planted firmly on your desk. The DRX-120L is a hefty puppy, too, at 3.8 pounds (4.8 pounds with cables and AC adapter). It comes with a FireWire cable and a software bundle inclu-

ding B's Recorder Gold for data writing, neoDVDstandard for DVD authoring, and PowerDVD for playback, among other applications. Sony covers it with a one-year warranty.

This external Sony actually equaled or bested its EIDE brother in most tests. It burned a 4GB DVD+R in 23:31, a 4GB DVD+RW in 23:02, a 700MB CD-R in 7:08, and a 639MB CD-RW in 8:01. It hit an average read rate of 3,517KBps in CD Tach (4,698KBps maximum) with 114ms random access and 296ms full-stroke access times. DVD Tach gave us inconclusive results on two different test systems, but the DRX-120L proved its DVD playback prowess movie-wise.

I'd love to recommend this drive, but the DRX-500UL adds support for DVD-RW and USB 2.0 for much less. That's where my money would go, if I had any. ▲



DRX-120L DVD+RW 2.4X/2.4X/8X

\$599.99
Sony
(800) 352-7669
(408) 432-1600
www.storagebysony.com



by Marty Sems

Memorex DVD+RW 2.4X/2.4X/8X CD-RW 12X/10X/32X



DVD+RW 2.4X/2.4X/8X CD-RW 12X/10X/32X

\$379.99

Memorex

(562) 906-2800

www.memorex.com



Memorex's model 32023251 is a nice DVD+R/+RW and CD-RW combo drive at an even nicer price. Despite its low cost, its software bundle includes Nero 5.5.8.5, Sonic MyDVD, CyberLink PowerDVD, and ArcSoft ShowBiz. The drive has a 2MB buffer and Just-Link buffer underrun protection. It supports Win95/OSR2/98/2000/Me/NT/XP and has a 1-year warranty.

I had the pleasure of using this drive during a roundup of DVD-authoring software, so I got to know it fairly well. Dang, but it was a trouper. It banged out video DVD+RWs and DVD+Rs in a reasonable amount of time, and the discs played just fine on an older Pioneer DVD-ROM drive. A few discs had audio glitches, but this turned out to be the fault of individual authoring apps, not the drive itself. The best part of all was that the

Memorex let me transfer some old video projects from analog tape to DVD. Can't wait to bore the hell out of future grandchildren with those.

In our more formal tests, the Memorex filled a 4GB DVD+R in 24:17. It also wrote 700MB to CD-R in 7:04 and 639MB to CD-RW in 7:56. That CD-R time isn't overly impressive, but not totally out of line for a combo drive. DVD Tach charted the drive's average read rate at 7,997KBps (10,772KBps maximum), while CD Tach reported 3,517KBps reading on average (4,699KBps maximum).

This Memorex was certainly tempting me with its capacity and reliability, but my intellectual side (such as it is) says to hold out for a drive supporting DVD-RW as well. If you're happy with the idea of a DVD+R/+RW-only drive, however, this is a super buy. It's also the least expensive 2.4X DVD+RW I've seen. ▲

by Marty Sems

Philips DVD+RW 2.4X/2.4X/8X CD-RW 12X/10X/32X



DVD+RW 2.4X/2.4X/8X CD-RW 12X/10X/32X

\$449.99

Philips

(800) 326-6586

(212) 536-0500

www.philipsusa.com



Part of the bumper crop of 2.4X/2.4X/8X DVD+RW drives this summer was Philips' DVDRW228. It's a capable DVD writer with support for write-once DVD+R discs, which Philips' previous DVDRW208 didn't have. It's also a 12X/10X/32X CD-RW drive, a DVD-ROM drive, and a CD-ROM drive, so it covers most of your optical media needs.

Philips endowed the DVDRW228 with Seamless Link buffer underrun protection, which quells some of my concern over its bare-minimum 2MB buffer. Its software bundle includes Pinnacle Studio 7 Special Edition, Nero Burning ROM, MyDVD, and PowerDVD. Our unit also came with a 30-day trial of Microsoft Publisher 2002 on CD. I would have liked to see some better packaging protecting the drive in its box. Folded cardboard doesn't cushion a drive against impacts very well after it's been torn or creased during removal of the drive.

This Philips drive filled a DVD+R with 4GB of mixed data in 24:09 (minutes:seconds), and wrote the same test folder to DVD+RW in 29:37. Once the 4X DVD+RW spec starts to arrive in new models, you'll see full DVD-burning times start to creep toward the range of full CD-burning times from the drives we used a couple of years ago.

Speaking of CD-burning times, the DVDRW228 wrote a 700MB folder to CD-R in 7:03 and a 639MB one to CD-RW in 8:15. Its partial-disc times, using a 427MB test folder for continuity with our archived reviews, were 5:02 for CD-R and 5:31 for CD-RW.

This Philips drive is part of a satisfactory package, but I'm still anxious to get my mitts on Sony's DVD+RW/DVD-RW combo drive. It's about \$100 less than the Philips, so I'm obliged to reserve judgment until all the facts are in. ▲

by Marty Sems

Razor Zayo A600

Razor (the maker of those trendy little scooters) is shouldering its way into the ultra-competitive PDA scene with the trim, light, and (not just a little) trendy Zayo A600. You won't find the Zayo at Razor's site, though. You'll have to go to www.zayotech.com and click one of the third-party vendor links there. In addition to its design, the Zayo accounts for its \$549.99 price tag with some fancy internal organs.

The icons on the four PIM shortcut buttons light up bright blue when you press them, and a light on the cradle displays a large blue back-drop to the Zayo logo when you recharge your PDA. The 240- x 320-pixel reflective TFT display is also bright, and Microsoft Pocket PC 2002 adds to the blue glow.

I liked the external Record button and the jog dial button, which lets you navigate Pocket PC 2002 without your stylus when you have only one hand free. At 4.9 inches tall x 2.9 inches wide x 0.5 inches deep; Zayo is one of the slimmer PDAs available. It is also light, at 4.9 ounces.

My only beef is with the Zayo's expansion slots. The Zayo has an SD slot, but you have to purchase an additional adapter (\$159.99) to use CF cards. You can also buy the Zayo Executive Package (\$649.99), which includes the Zayo and the CF card adapter. SD cards hold as much as 128MB, while CF cards hold as much as a gigabyte. If you use the Zayo to watch videos, you'll probably want the extra storage.

Under the chrome-colored shell, the Zayo carries an Intel 400MHz PXA 250 processor, 64MB of RAM, and 32MB of Flash ROM. Many apps (such as Word and Excel) won't require the processor to run at full speed, so the Zayo uses three modes to control the processor speed. For example, the processor will run at (or under) 200MHz when you listen to MP3s, saving battery life.

The Zayo is a solid PDA. If you're shopping around, consider the new kid. ▲

by Joshua Gulick



Zayo A600

\$549.99

Razor

(866) 467-2967

www.razor.com



Sony CLIE PEG-T665C

Sony's PDAs handle entertainment as well as they handle PIM applications. The CLIE PEG-T665C retains some of the best design features from its predecessor, the CLIE PEG-T415, but trades in the grayscale display for high-resolution color. Combine that color with audio, video, and remote control (as in, television, DVD, or stereo) capabilities, and you have one PDA you really don't want to drop.

A leather flip cover gives the PDA a wallet-like feel, and at 4.75 x 3 x 0.5 inches the CLIE has a trim, wallet-like look to it, as well. An aluminum shell protects the 66MHz Dragon-ball Super VZ processor, 16MB of internal DRAM, and 4MB of flash memory. You can supplement the internal memory with Memory Sticks from 16MB to 128MB. You need a Memory Stick to play MP3s or video.

What is all the power and storage for? Music, movies, and pictures. The CLIE's high-resolution (320 x 320) TFT display makes a notable difference when you view pictures. Movie quality is also decent for such a

small image, but the audio quality really stands out, thanks to the mega bass function, and Sony knows it. Sony ships the CLIE with a set of headphones.

The CLIE runs Palm OS 4.1, and Sony takes advantage of the variety of software that runs on the Palm OS. Sixteen Sony applications ship with the CLIE, including CLIE Paint, Mail, the Audio Player (Sony also ships skins for the player), and software that lets you use the CLIE as a remote control for your television, DVD player, and stereo. Another 18 third-party applications make up the CLIE's selection of video games, utilities, and productivity tools.

If you are serious about entertainment on the go, the CLIE won't disappoint you. It has the power to handle business applications just as well as any other PDA. But don't kid yourself: Unless you get paid to listen to MP3s and watch movies, your productivity will be singing those blues coming through your earphones. ▲

by Joshua Gulick



CLIE PEG-T665C

\$399.99

Sony

(888) 476-6972

(408) 432-1600

www.sony.com





Pocket PC e740

\$599

Toshiba

(800) 867-4422

(949) 583-3000

www.toshiba.com



Toshiba Pocket PC e740

The e740 packs significant power (for a PDA, at least) under its hood, and its integrated Wi-Fi (802.11b) capabilities make it even more attractive. Toshiba isn't forgetting Bluetooth, either; you can give the e740 Bluetooth capabilities with a separate SD card.

The e740 is a slim, if somewhat boxy 4.9 inches high x 3.1 inches wide x 0.6 inches deep. The left edge houses a scroll button and a second button that starts and stops the e740's record feature. The SD and Type II CompactFlash card slots sit parallel to each other at the top of the device. Despite the e740's numerous slots and buttons, I was able to hold it easily without accidentally bumping any controls.

The 240 x 320 resolution and front light make the e740's reflective TFT display bright and clear, even outside. The display itself felt particularly smooth when I slid the stylus across it. Most displays seem to give just a little resistance when I write on them.

A 400MHz Intel PXA250 processor powers the Microsoft Pocket PC 2002 OS. You can tap and hold the stylus on the display to open

menus, just as if you had right-clicked with a mouse. This feature makes it easier to perform actions such as Copy and Paste.

Toshiba's hefty software package might tip the scales if you compare the e740 with other PDAs. Pocket Word, Excel, Outlook, Internet Explorer, MSN Messenger, and Microsoft Windows Media Player 8 for Pocket PC give you something to do with that processor power. You'll need an Internet connection (through your wireless network) to make use of IE and MSN Messenger. Media Player 8 (which plays MP3s) puts a strain on battery life, so you may want to buy the optional high-capacity battery if you plan to listen to music. And unless you don't mind holding the e740 to your ear, you'll probably want to buy headphones because the e740's speaker isn't very loud.

Other than the e740's quiet speaker, I have no complaints. The e740 is powerful, its display is sharp, and it bundles with plenty of software. Plus, the integrated Wi-Fi is icing on the cake. ▲

by Joshua Gulick

Sony Net MD Walkman Player/Recorder MZ-N707



Net MD Walkman Player/Recorder MZ-N707

\$229

Sony

(800) 352-7669

(408) 432-1600

www.sonymstyle.com



The more I play with Sony's MiniDisc format, the more I like it. Not only are these discs shock-resistant and nearly scratch-proof, but they're also re-recordable and come with massive storage capacity—all of which makes me wish Sony had done a little more to improve its \$229 Net MD MZ-N707.

One big advantage the Net MD has over other portable music devices is its tiny size. It's small enough to fit into your palm, so you can take it just about anywhere. Plus, unlike your regular CD player, you won't have to worry much about battery life because the single rechargeable AA cell lasts up to 110 hours.

The Net MD is also solidly constructed (although the on-unit buttons aren't as responsive as those on the in-line remote). Best of all, the high-capacity discs let you easily store about four to five full music CDs or dozens of MP3s.

However, the OpenMG software that Sony includes is clunky, unintuitive, and downright

frustrating to use. Not only is the interface poor, but the program forces you to use a quirky checkout/check-in process that's supposed to prevent music pirating.

Even more infuriating is the fact that you can't upload data from the Net MD to your PC. That means you can't transfer an interview or concert that you recorded using an optional microphone, nor can you transfer music files. Finally, the fast transfer file speeds that Sony prominently touts on the packaging are good only if your PC has high-speed USB 2.0 ports. USB 1.1 transfers files much more slowly; my Pentium III PC transferred 14 MP3s in about 10 minutes.

If they can deal with the frustrating restrictions and bothersome software, the Net MD has interesting capabilities that digital music lovers will appreciate. Casual users need not apply. ▲

by Nathan Chandler

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

WHAT'S YOUR BURNING DESIRE?

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Whatever it is, chances are the Panasonic LF-D321U will satisfy it. That's because it burns DVDs using only DVD Forum approved formats like DVD-RAM and

AUDIO 



DVD-R. Only DVD

Forum approved formats

ensure information security and maximum compatibility between DVD players.

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It's perfect for Video, Data and Imaging applications.



Also included is a set of powerful software titles that gives you the ability to play, capture, edit and burn your Video files, as well as back-up your hard drive.



So if you're looking for the hottest DVD Drive that gives you the power to burn and more, check out the Panasonic LF-D321U today.

IMAGES 

DATA 

For more information, visit
www.panasonic.com/storage

Panasonic



DVD-CPU



USB ThumbDrive 64MB

\$59.99

Memorex

(562) 906-2800

www.memorex.com



Memorex USB ThumbDrive 64MB

USB flash memory devices strike a chord with the uninitiated. “Does it really work like a floppy?” they ask me. “Pretty much,” I say. Compatibility generally isn’t a big problem. Most of the desktops and notebooks sold in the past few years have USB ports, and most desktop OSes in use support flash devices. The problem is when a device inexplicably reads and writes as slowly as a floppy, which happened to me with the Memorex USB ThumbDrive 64MB.

Memorex’s ThumbDrive is essentially the Trek ThumbDrive Smart. It has a green activity LED and a diminutive write-protect switch. It is compatible with Linux 2.4.0 and later, Mac OS 8.6 and later, and WinMe/2000/XP/CE3.0 and later (Win98/98SE after a driver installation).

The bad news is that it took the ThumbDrive 14:06 (minutes:seconds; 0.06MBps) to save a 50MB test folder full of mixed file types from an IBM PC 300 with a 667MHz

PIII, 128MB of SDRAM, and WinXP Home. On an IBM 300GL with a 667MHz PIII, 192MB of SDRAM, and WinXP Home, the ThumbDrive slowed down to 19:33. Memorex sent me a replacement unit, which still took 13:36 to write the 50MB folder from the first PC (0.06MBps). Even on a brand-new Sony VAIO PCV-RX790G with a 2.4GHz P4, 512MB of PC800 RDRAM, and WinXP Home, the second ThumbDrive took 13:42.

After a conference call, Memorex sent me a third unit, which fared no better on my first IBM PC. I then transferred the same 50MB folder to a DiskOnKey 64MB in the same USB slot in 5:32, demonstrating that my system and folder weren’t at fault. Memorex says its in-house ThumbDrive tests fall near my DiskOnKey transfer time, so perhaps its review units came from a bad run. ▲

by Marty Sems

SimpleTech Bonzai USB Mini-Drive 64MB



Bonzai USB Mini-Drive 64MB

\$79.95

SimpleTech

(800) 367-7330

(949) 476-1180

www.simpletech.com



Hard on the heels of SanDisk’s Cruzer is SimpleTech’s more compact Bonzai USB Mini-Drive. Like the Cruzer, the Bonzai is a USB flash memory storage device and card reader/writer all in one. The Bonzai has a different style than the slick Cruzer, however, with a tough, nonslip plastic shell and a pocket clip on its cap.

Also like the Cruzer, the Bonzai is upgradeable with SD or MMC cards. To change the Bonzai’s flash memory card, you have to slide its back panel off and then use a fingernail (preferably your own) to pull out the card.

The card went back in easily, but getting the panel back on the Bonzai confused me for a while. I finally figured out that the secret to this is to depress the internal card drive’s metal hull with one thumb as you slide the panel back on with the other thumb. Once you master this little trick, you are on your way to becoming a fulfilled, self-actualizing Bonzai owner.

Although the 64MB Bonzai model (\$79.95) is the smallest version that is currently offered on SimpleTech’s Web site, the company sent me a 32MB demo unit.

I will give you my test results anyway, as there probably isn’t a huge performance delta between the 32MB and 64MB SD card (hey, if I start to talk like a hardware reviewer, maybe they will let me climb into the tree house and join the club).

The Bonzai 32MB model saved a 25MB folder of mixed file types in 58 seconds. That comes out to about 0.43MBps, or 0.1MBps faster than the Cruzer’s speed was in saving a 50MB test folder.

The Bonzai has a 2-year warranty and supports Win98 SE/Me/2000/XP. It also supports Mac OS 8.6 and later and Win98 after you install a necessary driver. In short, the Bonzai is cute, and it works. ▲

by Marty Sems

Microsoft MultiMedia Keyboard

Are you fun, serious, or sophisticated? Microsoft has identified three types of computer user and is rolling out customized keyboards and mice that should satisfy your sense of function and style. First in the lineup is the “fun” MultiMedia Keyboard. So if you’re fun, or you’re just attracted to its Astral blue paint job, read on.

Below its function keys, the MultiMedia Keyboard has the same computer-putty color most Microsoft boards wear. The board’s top portion is blue and houses a string of shortcut buttons. Icons atop each of these Hot Keys indicate the application, folder, or command the button will activate by default. For example, Windows Messenger will start if you press the Hot Key displaying the Messenger icon, but you can easily program any button to open a different app using Microsoft’s IntelliType Pro software, which is included. IntelliType Pro is the best software for assigning shortcut keys I’ve seen. It clearly explains the purpose of each default shortcut, lets you

restore the default settings, and nestles in your keyboard properties, making it easy for you to find.

Microsoft adds extra shortcuts and commands to the function keys. The F LOCK key lets you toggle between shortcut and function modes. I’m impressed by Microsoft’s choice in shortcuts. You can shut down an application by pressing the CLOSE key instead of hunting for the X with your mouse pointer. I also like the SPELL key, which shortcuts to the spell checker. You can hold CTRL and press keys on the QWERTY keypad to use other shortcuts. Microsoft uses the dual-function keys to pack extra features into the board without giving it a cluttered look.

None of the MultiMedia Keyboard’s features are eye-popping, but Microsoft isn’t shooting for a groundbreaking board. The MultiMedia Keyboard is the stylish, feature-packed keyboard Microsoft promised. ▲

by Joshua Gulick



MultiMedia Keyboard

\$34.95

Microsoft

(800) 426-9400

(425) 882-8080

www.microsoft.com



Kensington Mouse-in-a-Box Optical

The Kensington Mouse-in-a-Box Optical is exactly what it sounds like: literally a mouse in a box. There are no installation CDs or odd accessories included in the package, but you don’t need the extras with this mouse because its appeal is its ease of use.

This mouse’s body is gray (with just a bit of sparkle under the right lighting) with a blue belly and blue scroll wheel. The mouse has the standard left and right buttons, and that’s it. Although there isn’t much to the design, the mouse was comfortable to use. With its textured surface, you can get a good grip, and when you click the buttons, they have a nice spring to them. The scroll wheel is a bit noisier than some others, making a slight grinding noise as it turns, but it responds nicely. Overall, the Mouse-in-a-Box Optical has quick and accurate responses to movements and clicks.

Because this model is an optical mouse, I subjected it to the usual tour of mousing

surfaces at my desk. It worked exceptionally well on textured mousepads, and even when there was a slight degree of reflectivity, the Mouse-in-a-Box Optical didn’t get tripped up. More reflective surfaces caused some problems (as they do with virtually all optical mice), but I didn’t find a surface on which the mouse was completely unresponsive. The Mouse-in-a-Box worked well on standard surfaces, such as a plain mousepad, a desk, and a stack of paper.

The price of this mouse is in line with other basic, optical mice. However, I would feel a little better about paying more than \$20 if the mouse bundled software that let you add functionality to the mouse buttons. On the other hand, the Kensington Mouse-in-a-Box Optical achieves both simplicity and solid performance. ▲

by Kylee Dickey



Mouse-in-a-Box Optical

\$21.99

Kensington

(800) 235-6708

(650) 572-2700

www.kensington.com



Canon CanoScan D2400UF



CanoScan D2400UF

\$499
Canon
(800) 652-2666
(516) 328-5000
www.usa.canon.com



You expect quality from a \$499 scanner such as the Canon D2400UF, and Canon does a good job of meeting that expectation. The D2400UF is a well-built scanner that's easy to install and easy to work with. I even disconnected it from the USB port a few times with no trouble. (This has been known to cause problems for scanners in the past.)

The D2400UF isn't the best in its price range, but it scans decent enough to be an alternate. Six scans performed at 600dpi all finished in less than a minute, averaging 46 seconds per scan. Scans performed at 150dpi averaged 14 seconds a scan, which is comparable to other scanners in this price range.

I was disappointed with the color in darker scans. Details were sharp, and lines were distinct in photos with a lot of color. But details were lost in dark backgrounds, which is to be

expected to some extent with any scanner, but less so with a higher-priced scanner such as this one. On a more positive note, preview adjustments the scanner performed are some of the best I have seen. I hardly had to tamper with them to achieve a nice scan.

The D2400UF is equipped with a removable panel in the lid and two one-touch buttons for scanning slides and negatives. The four slide scans we performed were clear of any imperfections or blemishes, and the colors blended nicely, resulting in scans that were precise in color and detail.

Overall, the D2400UF excels at scanning slides and negatives but could use a little help in scanning darker images. If you're in the market for a scanner that can do more than scan images and email them to friends and family, put the D2400UF on your list of scanners to consider, but don't exclude other options. ▲

by Mary Lafferty

HP Scanjet 3500c



Scanjet 3500c

\$99
Hewlett-Packard
(800) 752-0900
(650) 857-1501
www.hp.com



Hewlett-Packard is always one of the top competitors when it comes to scanners, and the tradition continues with the new Scanjet 3500c. The 3500c isn't the best product I have seen from HP, but it does have HP quality.

Price-conscious consumers not only get a quality scanner for \$99 but some decent scans, as well. I was pleased with the results of scanning our usual six photos (three in color and three in black and white). Colors in the scans are close to the originals, and details are clear and definite. Edges on the black-and-white text scan I performed were clean-cut and had enough light to make the details clear without making the white too fluorescent.

The scanner has the usual three one-touch buttons: Scan, Email, and Copy. That's nothing to get too excited about, but after testing so many scanners, it takes a lot to get me excited. A 35mm negative and slide adapter is available for \$79.99 at www.hp.com or through an

online retailer. The adapter replaces the standard lid that detaches to scan 3D objects.

Scan times were better than average for a scanner in this price range, coming in at just less than a minute for scans performed at 600dpi. Surprisingly, text took the longest to scan, at almost four minutes. The scanner also performs well at its highest resolution of 1,200 x 1,200 dpi, scanning images in a speedy seven minutes where other scanners in this price average from 10 to 35 minutes. Speedy scans are nice, but I was a little annoyed not to get my usual nap in.

The single biggest disappointment I had with the 3500c is the annoying squeak it creates while scanning. Although the squeak is bearable and isn't loud enough to influence my thoughts about the scanner, it could drive me crazy after awhile.

With good results at decent prices, it's no wonder HP has been on the top for so long. What else would you expect? ▲

by Mary Lafferty

Gateway Profile 4X

Although all-in-one computers have been around for a while, last year's goose-necked iMac reheated the competition among manufacturers for making portable desktop machines that actually work well. Many, including Gateway, haven't entered the fray with any heavy hitters. On the contrary, most entries are little more than upended notebooks with a strap-on keyboard. Gateway recently upped the ante a bit, however, with its new Profile 4X, which is definitely superior to its predecessor, the Profile 3CX.

Specifications. There are three basic configurations for both the iMac and the Profile 4. Although the main difference between the iMac configurations is the optical drive type (CD-RW vs. CD-RW/DVD-ROM vs. CD-RW/DVD-RW, and granted, there are minor hard drive differences between hard drive sizes and processor speeds), there are more significant differences between the Profile 4 configurations. On the low end (Profile 4SE), you have a 1.7GHz Pentium 4, 128MB of SDRAM, a 20GB hard drive, and a CD-ROM drive. On the high end (Profile 4XL) is a 2.66GHz Pentium 4, 512MB of SDRAM, a 120GB hard drive, and a CD-RW/DVD-ROM combo drive. You won't find DVD-burning options with the Profile 4 systems, even when you customize.

Now for the middle of the road: I looked at the Profile 4X, which has a 2GHz Pentium 4 on an Intel 82845 motherboard with a 400MHz bus, 512KB L2 cache, and 256MB DDR SDRAM. This configuration includes a zippy 7,200rpm Maxtor hard drive with a reasonable 40GB capacity (you can double the capacity for \$60 extra or triple it for \$200 more). In the optical department, the 4X has a Toshiba SR-C8102 CD-RW that writes at 16X, rewrites at 10X, and reads at 24X.

An NVIDIA GeForce2 MX card with 32MB of DDR provides decent video performance for the niftily sharp 17-inch LCD, which of course is attached. You won't be enjoying any high-end 3D games on this system, though. There are two stereo speakers that provide the same sound quality you get from a high-end notebook. A Sound MAX Integrated Digital Audio adapter pumps out the sound.

The system has a Gateway V.92 VoiceModem, an Intel PRO/100 10/100 Ethernet adapter, and a built-in multimedia keyboard. For ports the 4X has one serial, one parallel, and six USB. The system comes with Windows XP Professional Edition and a cool roundup of software on CD, including Easy CD Creator 5 Basic, Music-Match Jukebox, and Norton AntiVirus 2002.

Design. I found the Profile 4X to be better, in terms of base configuration and upgradeability, than many all-in-one PCs. In comparison with the iMac, the Profile 4X has greater CPU speed and more memory upgrade flexibility, and the iMac has a better-looking design and more optical drive options. Of course, the iMac has the adjustable-monitor thing going for it, which all-in-one PCs like the Profile 4X, sturdy as it is, just won't touch. I appreciated the Profile 4X's design in comparison to earlier Profile designs.

The Profile 4X's six USB ports extend its capabilities some. As with most all-in-one computers, however, there aren't any free PCI slots or drive bays waiting to be filled.

Performance. The system scored a lowly 2,784 with the 3DMark2001 benchmark, but it fared quite well when faced with our other benchmarks. SYSmark2002 results included 258 in Internet Content Creation and 124 in Office Productivity for a Total rating of 179. And in PCMark2002 Pro, where 2,000 is the baseline for good CPU and Memory scores, the Profile 4X earned a 4,881 CPU Score and a 4,328 Memory Score. The HDD Score was 776, which isn't bad (the scale is different for this score).

Final word. In terms of components, you'll get more for your dollar with the Profile 4X than you will with the iMac. For me, though, until all-in-one computers grow some bigger multimedia muscles, I'd prefer a notebook or a desktop, not a combo. That said, the Profile 4X would likely be a welcome gift to any non-Apple-oriented college student, and it would serve anyone well who wants a PC primarily for running office apps and browsing the 'Net. ▲

by Cal Clinchard



Profile 4X

\$1,739
Gateway
(800) 846-4208
(605) 232-2000
www.gateway.com



Features

Processor:
2GHz Pentium 4

RAM:
256MB DDR

Hard Drive:
40GB

Optical Drive:
CD-RW
(16X/10X/24X)

Connectivity:
V.90 56Kbps
modem; 10/100
Ethernet

Chassis Type: All-in-one

System Use: Home use

Final Word: A Gateway-Pentium iMac alternative.

IBM ThinkPad X30

ThinkPad X30

\$2,569

IBM

(888) 746-7426

(914) 499-1900

www.ibm.com



With a long battery life and lightweight chassis, IBM's X series of notebooks are built with those ramblin' souls among us in mind. The latest, the ThinkPad X30, provides more of what we expect to find in IBM's lightest ThinkPad series.

Specifications. The Pentium 4-M is a bit too power hungry for the svelte X30 (3.7 pounds), so IBM opted instead for a 1.2GHz Pentium III-M processor. Although not as speedy as Pentium 4-M based systems, the 1.2GHz processor in the X30 is the fastest processor I've seen in the X series to date.

The X30 makes do with an older 133MHz front side bus and older SDRAM memory. Again, these are common features among ultraportables. Our X30 arrived with 256MB of SDRAM, but it can support as much as 1GB of SDRAM.

The notebook's 40GB hard drive is one of the more spacious drives I've seen in a notebook as light as the X30. Each drive can add significant weight to a notebook, so the X30 only supports the hard drive. An optional ThinkPad X3 UltraBase (\$199) attaches to the bottom of the notebook and includes two modular bays for a floppy and optical drive. You'll also find space for a second battery in the UltraBase.

The 12.1-inch TFT display is small but typical of lightweight notebooks. The integrated Intel 830MG graphics chip saves space, but it uses a portion of system memory.

Our X30 also included a modem and Ethernet port. The X30 includes integrated support for 802.11b, a nice feature to have in an ultraportable.

Design. Considering the physical size of the X30 (1.19 x 10.7 x 8.8 inches), the keyboard is pretty good. My biggest complaint with the keyboard is that the BACKSPACE key is about the size of a letter key. I use that key a lot, and it just feels funny when it's so small. The first few times I reached for the BACKSPACE key I accidentally pushed the plus (+) key. IBM is

also well known around these parts for not including a WINDOWS key.

The display's 1,024 x 768 resolution is about perfect for the 12.1-inch display. A higher resolution might force me to resort to a magnifying glass just to read a Word file. Color looked decent and text was sharp and easy to read.

The more you carry something around with you, the more beat-up it becomes. The X30 wouldn't be complete without a solid titanium shell to help protect the notebook from all those missteps you're likely to make on the road.

The X30 isn't really designed with multimedia in mind, so it's no surprise its sound system is so crummy. A single speaker mounted to the bottom of the X30 is all the audio you'll get from the system without the UltraBase clipped to the bottom. The single speaker is enough for Windows' little alert sounds, but if you plan to listen to music, you'll want a good pair of headphones. The UltraBase includes stereo speakers that sound much better than the single speaker on the X30.

Performance. Ultraportables are skewed more toward battery life than performance, so it's not surprising to see the performance numbers lacking compared to larger desktop replacements. Compared to other ultraportable systems, the X30 is a good performer. MobileMark 2002 reported a Performance Rating of 91. MobileMark 2002 also reported a Battery Life Rating of 208 minutes. This falls well short of IBM's reported 4.6-hour battery life, but 3.5 hours is still pretty impressive. According to IBM, the X30 Series Extended Life Battery clips to the bottom of the notebook to provide up to 8.9 hours of battery life.

PCMark2002 scores showed the difference between the PIII-M and Pentium 4-M and desktop processors used in heavier notebooks. The X30 managed a CPU score of 3,771, a Memory score of 2,075, and an HDD score of 503.

Final word. Overall, the X30 is a top-notch system for those who value mobility over performance. It is a little disappointing that the UltraBase costs extra, especially when other manufacturers include similar devices with their lightweight models. Nonetheless, the X30 is a first-rate portable. ▲

by Chad Denton

Features

Processor:
1.2GHz Pentium III-M

RAM:
256MB/1GB

Hard Drive:
40GB

Optical Drive:
None

Connectivity:
Modem;
Ethernet;
802.11b

Display: 12.1-inch TFT

Weight: 3.7

Final Word: Good performing lightweight notebook with integrated WiFi and great battery life.

CPU Ranking: 0 = Absolutely Worthless 2.5 = Absolutely Average 5 = Absolutely Perfect

Sony VAIO PCV-RX790G

If you've been waiting for a powerful, pre-configured system that's ideal for video editing, your wait is over: Sony's new VAIO PCV-RX790G gets the job done and includes Sony's usual slew of software.

Specifications. The RX790G has a powerful cadre of processing and memory hardware: an Intel 82850 chipset with a 2.4GHz Pentium 4, 533MHz FSB, and 512KB L2 cache, plus 512MB of PC800-40 RDRAM. This get-up quadruples the basic capabilities necessary for even-handed video editing. There's also a fast 7,200rpm IBM DeskStar hard drive with a 120GB capacity, a 3.5-inch floppy drive, and a Memory Stick media slot for sharing data with portable Sony devices.

Of course, what good is a video-editing machine without DVD? The RX790G doubles your order with a Toshiba 16X DVD-ROM and Pioneer's awesome DVR-104. The multi-talented DVR-104 writes CD-Rs and CD-RWs a little feebly, at 8X and 4X respectively, but doubles as a DVD-burner and writes DVD-Rs at 2X and DVD-RWs at 1X.

Sony systems often have integrated video, but the RX790G has an NVIDIA GeForce4 MX 440 video card with 64MB of DDR and a TV tuner. There's also bundled video-editing, DVD-making, DVD-playing, and TV-watching software and a Giga Pocket remote control with more buttons than most folks will ever need.

Also onboard are an integrated Yamaha AC-XG Audio adapter, Lucent Winmodem 56Kbps/V.90 modem, a Realtek 10Base-T/100Base-TX Fast Ethernet NIC, one serial port, one parallel port, four USB ports, two i.LINK (aka FireWire) ports, one S-Video port, and a set of three standard RCA jacks for audio/video input.

The system, like all Sony systems, comes with enough software to make a reviewer swoon. Check out the SonyStyle.com site for details.

Design. The foundation for the system's design is Sony's cookie-cutter minitower case, but it's never looked as good as it does packed with all this great hardware. There isn't much room inside, but the motherboard is reasonably accessible, and a system of levers lets you mess with the drives using your bare hands and, occasionally, a Philips screwdriver. Only two of the four memory slots are occupied, so you can

increase the memory up to 1GB.

On the front of the case, flip open a small door below the two 5.25-inch drives and you'll see the 3.5-inch floppy drive and Memory Stick slot. A door at the bottom front of the case conceals the S-Video port, RCA jacks, two of the USB ports, and one i.LINK port. The remaining i.LINK and USB ports are on back, as is a cable-ready composite port.

Performance. I had a blast testing the RX790G. I played tracks from a Charles Mingus CD and ran through a few chapters from "The Matrix" on DVD; I found the video playback flawless and the audio playback surprisingly rich for a simple set of stereo speakers sans subwoofer.

I ran a couple DVD burn tests to see how well the Pioneer DVR-104 would handle copying 2GB of data from DVD and from the hard drive. Faced with the DVD copying test, the drive spent 2:18 (minutes:seconds) reading the data and 14:37 initializing, copying, and finalizing the DVD-R. For the other test, it took the drive 19:47 to copy 2GB of data from the hard drive to DVD-R.

The RX790G performed exceptionally well during the SYSmark2002 and PCMark2002 Pro benchmarks, and it didn't do too shabby when faced with the 3DMark2001 benchmark, either. For SYSmark2002 scores, the system earned 261 in Internet Content Creation and 177 in Office Productivity for an overall score of 215. For PCMark2002 Pro, the system earned a 5,684 CPU Score, a 5,755 Memory Score (for CPU and Memory, 2,000 is average), and a 991 HDD Score. The 3DMark2001 score was 5,747.

Final word. The RX790G lets you accomplish virtually any video task with incredible focus. Whether you need to transfer video from a digital or analog camera to PC, watch television or record programs while you're away, or copy homemade DVDs for family and friends, the RX790G has it covered. ▲



VAIO PCV-RX790G

\$2,499 (without monitor)

Sony

(888) 595-8246

(941) 768-7669

www.sonymstyle.com/vaio



Features

Processor:
2.4GHz Pentium 4

RAM:
512MB PC800-40 RDRAM

Hard Drive:
120GB

Optical Drive:
DVD-ROM;
DVD-R/RW

Connectivity:
56Kbps modem;
10/100 Fast Ethernet

Chassis Type: Mini-tower

System Use: Home use

Final Word: Excellent system for video editing and other multimedia tasks.

by Cal Clinchard

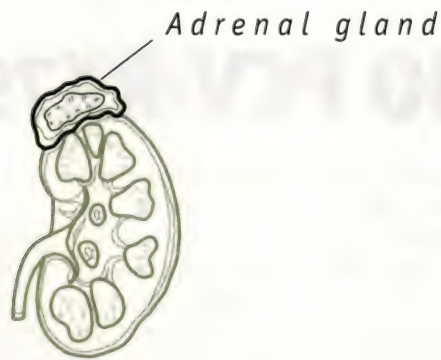


fig.1



One essential piece of equipment for this game is in your body.

The other is in your computer.

A teeth-grinding adrenaline rush. A grenade-sized lump in your throat. The trigger-tingling sense that someone is watching you. It's all part of the over-the-top realism you'll experience in *Soldier of Fortune 2: Double Helix*. Why? Because this ultra-realistic game was designed for the optimum performance you can only get from a computer juiced with the high-speed performance of an NVIDIA® graphics processor. So plunge into the secret and deadly world of covert operations with the firepower of NVIDIA... and play the game the way it was meant to be played.



Visit your local CompUSA or log on to www.gamefixx.com/nvidia/

NVIDIA Delivers nForce2

It's NVIDIA's second attempt at a chipset and I'm already seeing some of the same mistakes made with the original nForce. The most bothersome is NVIDIA's plan of attack with nForce2: launch in July, release benchmarks in October, and finally ship in November. Let's compare this to Intel's recent launch of their 845PE and 845GE chipsets: launch on October 7th, boards available immediately. Do you see a problem?

With that said, NVIDIA's nForce2 is shaping up to be the Athlon XP chipset to get. Let's take a look at what it offers: integrated GeForce4 MX core, very high-speed memory controller (dual-channel DDR), optional dual integrated Ethernet controllers (one from 3Com, one from NVIDIA), integrated FireWire and USB 2.0, and NVIDIA's nForce APU (Audio Processing Unit), unchanged from the original nForce.

Now the integrated graphics, FireWire, USB 2.0, and APU are all nice features, but there's not much to talk about there. The sound quality is just fine and the performance of the APU is nothing to complain about. The integrated graphics are nice as well, since it means you can really have a system without any add-in cards, although hard-core gamers will definitely want to use the AGP 8X slot for a GeForce4 or Radeon 9700.

What I will focus on, however, is the performance of the nForce2 and its Ethernet support, because those two aspects really set it apart from the competition. One of the biggest features of the original nForce was its DASP (Dynamic Adaptive Speculative Pre-Processor) unit. DASP looks at the access patterns of your applications and predicts what data will be requested next and brings it into a small internal cache located on the chipset itself. Should the data actually be requested, the CPU now only has to go as far as the chipset to retrieve the data instead of working its way all the way down to main memory and back. The idea behind DASP was that with two 64-bit DDR channels, there would be enough spare memory bandwidth not used by the CPU to allow this prefetching to go on. Unfortunately, in the original nForce, DASP didn't work as well as it should have and performance with dual channel DDR was not improved unless you were using integrated graphics.

Much to my surprise, things have changed with nForce2. The second-generation DASP now has much more intelligence and predicts future accesses with much greater accuracy than before. The improved DASP also does a better job of keeping its prefetches out of the way of real work, and there is also a better reduction in latency when DASP actually prefetches correctly. The result is that nForce2 now actually increases performance with dual channel DDR and its performance across the board is improved tremendously, giving the nForce2 the crown of highest-performing Athlon XP chipset available.

The other point I'd like to talk about is the nForce2's integrated Ethernet controllers. The high-end version of the MCP (Media &

Communications Processor; basically, a South Bridge) known as MCP-T has two integrated Ethernet MACs—one from NVIDIA (identical to the one in the original nForce) and one from 3Com. The addition of the 3Com MAC helps give nForce2 credibility in the corporate market;

you'd be amazed at how far that 3Com logo will get you, even though the MAC is no more capable than NVIDIA's own solution.

It is NVIDIA's MAC that's actually truly impressive; I ran some tests for AnandTech and the NVIDIA MAC consistently performed on par with some of the best add-in Ethernet cards available; the advantages were mainly in very low CPU utilization. On my Athlon XP 2800+ test system, the NVIDIA controller consistently used between 7% and 12% of the CPU while doing heavy file transfer tests. This was on par with what the Intel NICs were using but significantly less than most other network cards, with most falling in the 20% to 40% range. I even had one generic card eating up close to 60% of the CPU during heavy transfers!

Combine the excellent networking with the high performance and the rest of the features and NVIDIA has put forth a very impressive chipset with nForce2. ■

You can reach Anand at Anand@cpumag.com.

Much to my
surprise, things
have changed with
nForce2.

Holiday Wish List

10. T-Mobile Sidekick
9. Sonicblue Rio Central
8. Sonicblue ReplayTV 5000
7. Nikon D100
6. Shuttle SS51BG w/ 3.06GHz Pentium 4
5. Pre-Production Banias Notebook
4. Native Serial ATA Hard Drives (not ones with a built-in Parallel-Serial converter)
3. AMD's Hammer (I know, it's delayed, but can't a guy wish?)
2. Windows XP Media Center Edition on a silent Home Theater PC
1. A week-long vacation someplace warm

Holiday Gaming



The holiday season is the best time of the year to be a gamer. First, you actually have days/time off, what with Turkey Beak Day, Christmas, Kwanzaa, and Boxing Day. Second, it's when all the developers' hard slog for the last 18 months comes to a culmination. Largely because by that time, they've run out of money from the publisher's advance (trips down to Tijuana add up eventually), and said publisher slams down gauntlet hard with the whole "We need this for our Q4 Christmas sales figures, you buggers" argument. So the "when it's done" argument doesn't apply unless you're John Carmack.

In H.A.R.M.'s Way

From a plethora of really great titles this holiday season, one really does stand out from the crowd, No One Lives Forever 2: A Spy in H.A.R.M.'s Way. In this sequel to the original Bond-spoof-Austin-Powers-in-a-skirt No One Lives Forever (NOLF), you still play the UNITY spy-chick Cate Archer and are up against H.A.R.M.'s worldwide crime syndicate in the 1960s. Cate is armed with an arsenal of guns, lipstick, and all kinds of spy gadgets, including a banana skin for tripping up H.A.R.M.'s cronies and the Angry Kitty Proximity mine for good measure. If you haven't played the original, shame on you, but don't despair because you've probably missed out on some growing pains in the series, as this time around the game has weaned out some of its weaker elements. No longer is there a painstakingly pissy stealth section, which would have a fit if you got caught creeping around, set off alarms, and make you restart. In NOLF2 you can choose to be stealthy when you feel the need to and follow the advice of your mission brief or you can go gung-ho-crazy when you've been warned that stealth is the better part of discretion. Admittedly, if you choose to go bananas instead of stealthy and trigger localized (yay!) alarms, you'll more than likely be over-swamped by an insane amount of goons, with relatively decent AI to boot. There seems to be more teamwork involved, with some guards firing upon you whilst others flank you at the same time. And when all hell breaks loose, enemies are triggered off by alarms and gunfire and run to the aid of their buddies instead of larking about with nothing doing, waiting for you to pick them off in sniper mode.

This one's got
"Game of the Year"
written all over it.

This game is very well balanced in single player mode, and the story is both funny and keeps you guessing but doesn't make you lean toward tapping the Spacebar this time. Cut-scenes are still campy but not so long and overdrawn. There are some 40 well-thought-out levels across various scenarios, including India, Japan, and Akron, Ohio. This is all played out utilizing the new LithTech Jupiter 3D engine, which doesn't rival the new Unreal Tournament engine but does a fine job stressing your 3D card's resources nonetheless. The multiplayer is nothing to write home about, but for that purpose I would suggest Unreal Tournament 2003.

Pick a couple of days during the holidays and tell your spouse to have some Christmas spirit and leave you alone because it's

addictive, intuitive, good looking, and downright snazzy. Well done to Monolith. This one's got "Game of the Year" written all over it.

Xboxing

When I've had more than enough carpal tunnel syndrome, there are also some neat sidetracks on the pseudo-PC console, commonly known as the Xbox. Racing around in hot cars is far safer this time of year on the big-screen TV. Sega GT is currently the most option-ridden and in-depth racing game available the other side of Gran Turismo A-Spec, of course. The graphics are top-notch, there are plenty of cars in the garage thanks to licensing, and the game goes on for ages and ages. Well worth \$49. If it's too much of a simulation, then go back to the PC and try out Need For Speed Hot Pursuit 2. Other games I'm currently into here are Kelly Slater's Pro Surfer and TimeSplitters 2, which is sort of an upper middle-class version of Halo and certainly not a poor man's.

So have a great holiday season and don't drink and drive, folks; play games instead. Of course if you just dislike gaming and ain't got no time for jibba jabba (thanks, Mr. T), there's always . . . www.rathergood.com/independent_woman. ■

Email me all of your unwanted Christmas pressies, and I'll send you a sock full of Space Bunnies Must Die. sharky@cpumag.com

Holiday Wish List

1. A live NV30
2. An AMD ClawHammer
3. Doom III
4. Epic northern pacific swells
5. Radeon 9700 All-in-Wonder
6. A Reus Car Audio System
7. Pentium 4 3.06GHz with HyperThreading
8. Springdale
9. Authority Stage V
10. Voice acting work in games

LANning Made Easy



Holiday Wish List

10. BFG NV30 with temperature monitoring
9. Jewel cases with all my \$50 games
8. Morrowind to not suck anymore
7. HyperThreading to let me play Counter-Strike while I encode DivX
6. For all the mainboards we get next year to actually work
5. Stock market prices up, Flagship Pentium 4 prices down
4. SLI 9700 Pros
3. 24-inch LCD worthy of gaming on
2. For the President of Uganda to quit spamming me
1. For my Xbox not to explode into flames anymore endangering my family

Have you ever been to a LAN? If you have, raise your hands. Looks like quite a few of you have never bothered to get out there and frag a fellow human "face to face." Why is that? Hmmm, interesting excuse. So you didn't want to crawl under your desk on your hands and knees in all that dust and start unplugging stuff, hoping to get it all back right again? So you didn't want to carry all that equipment out of your casa and stuff it haphazardly into your car? So you didn't want to drive across town, unload the stuff, set it up, and pray to the gods of Ethernet it actually still works . . . and then of course take on the whole process again going home? What a big bunch of wussies you guys are; you shame your *Computer Power User* brethren. I can't go on; talk to you next month.

Seriously, if you actually like any of the circumstances that lead up to and follow serious LAN gaming as questioned above, you should probably seek professional help. Moving thousands of dollars worth of critical and fairly fragile equipment is the number one reason more of you don't LAN game. Although gaming online is great, getting to talk smack to the guy you just fragged is also a big rush. Not to mention that interaction with non-virtual humans has to be good for you as well. LAN gaming is wildly popular now; it's going to get even more so in the future, and ATI Technologies (www.ati.com) is one of the companies that's going to make it possible.

Imagine this scenario: You get home from work on a Thursday, and your non-gaming significant other has already set up camp on the sofa for some Must See TV action. Great deal, this means you can get some Must Gib Gaming action in. While checking out your email, you see there's some LAN gaming going on over at Joe's apartment. You let the Must See TVer know you're taking off, grab your gear, and you're gaming at Joe's inside of 30 minutes. What's even more incredible is that you'll only stay a couple of hours, get in some good frags, then head back home before the news film rolls at 11.

I imagine some of you are thinking, "I wish he would get to the hardware part." But really, this is exactly the point: You don't have to think about the hardware, you just need to concentrate on fragging and not the tons of things you have to remember to do to get there.

ATI has introduced a new video chipset named the Mobility Radeon 9000 that's soundly built on the same technology you'll now find in its current mainstream VidCard, the Radeon 9000 Pro. Although it's not up to all of the desktop specs, what it does is quite amazing. If you guessed the Mobility is a laptop computer part, you'd be very correct. It is a video chip you're going to see become very popular in many brand name laptops very soon.

The Mobility Radeon 9000 delivers frame rates that will let you play Deathmatch on a LAN. The Mobility will let you play first person shooters with a ton of the eye candy turned on. You want more than eye candy? The Mobility can deliver 2-sample antialiasing and 16-sample anisotropic filtering while gaming. It's simply quite an amazing thing to experience on a high-end laptop.

As for right now, you'll mostly see these chips on high-end laptops. The ones

that we tested on were 2.2GHz Pentium 4 systems. So at their debut, there aren't going to be cheap, but then again new technology never is.

For all you specification junkies out there, the Mobility Radeon 9000 is a 30-million transistor part that sports up to a 250MHz core speed coupled with a 128-bit 230MHz DDR memory interface. Check out our full article at HardOCP.com at <http://www.hardocp.com/article.html?art=MzQ5> for more.

As for LAN gaming in the future, it's getting close to us grabbing one bag and heading out the door. And that will certainly make the entire gaming experience much more fun. ■

Moving thousands of dollars worth of critical and fairly fragile equipment is the number one reason more of you don't LAN game.

*What got censored?
Ask Kyle@cpumag.com to find out.*

Each month we ask a staff writer to take on our publication editor in a challenge to build the best PC for a certain price. Because our writers don't want to lose their jobs, they always accept this challenge willingly. Tempers will flare. Tools will fly. But only one will prevail.

This month the challenge is to build the **Best Budget PC for less than \$500.**

Samit

As every Trekkie knows, we are carbon-based units, while our PC companions are silicon-based. And speaking of silicon, let me introduce you to this month's PC Challenge contestant: Burbie! (Special thanks to Blaine's daughters, Mikah and Ella, for providing me with a couple of beautiful, anatomically incorrect, bipedal case mods for our Burbie.)

With a case that is not only a fashion statement, but cries out, "I am somebody!" whoever takes Burbie with them to their next LAN party will be the envy of every post-pubescent male in the room. Heh. OK, more seriously, have you seen the cover this month? The cream of the crop, top guns, right stuff, et al. Yeah, check out our cover story on page 46 for some seriously hard PCs. Anyway, I decided to put together a nice, nearly disposable PC for the kiddies.

As many of you know, I got married in September and suffered a mild testosterone drain, hence a PC with a pink handle. Besides, all the bum rushes by my nieces Megan, Emily-bear, and Brooke made me think of putting together a cute (and really cheap) PC for the young 'uns during the holidays. Without further ado, here is what Burbie's hiding under that big, pink curve of a handle...

The box comes with an Intel 810 mobo with integrated audio/video/modem, four USB ports, a serial port, floppy diskette drive, and a 40X Lite-On CD-ROM drive. I tossed in a Celeron 433, 40GB 5400rpm hard drive (about which I had buyer's remorse), 256MB

PC133 RAM, silver CompUSA speakers, dual-boot Windows 98 SE and ELX Linux (www.elxlinux.com), and ended up with a \$315 system.

If I had been actually building this for personal use without a pending deadline, I would have either ripped out an old hard drive from one of my systems or purchased the 7200rpm 30GB Maxtor hard drive Office Depot had on sale just before we went to press (\$29.95 after rebates, online coupons, and free shipping). Plus, I have some old dinky speakers sitting around, and I could have knocked the price down to nearly \$250. I might even have thrown in a new Envion 17-inch flat-screen monitor for \$49.98 (from Staples after coupons and rebates).

Load up the Burbie with a bunch of discount children's software and let your kids go to town. And when the time is right, go ahead and donate the entire box to your local charity. What? No interest in our friendly Burbie or Nathan's Dognap? Fine. Gather up your old hardware and build a stable low-end PC with it. Go ahead and donate *that*. We'll be back with more testosterone next month. Happy holidays.



Monitor not included

THE PC CHA



Samit Choudhuri
Publication Editor
Computer Power User

Component	Model	Price
Case	Enlight FlexATX "Burbie" Minitor with Enlight 8156903 150W PSU ¹	\$99
Motherboard	Intel BP810 FlexATX ¹	
Processor	Intel Celeron 433MHz ¹	\$33
Memory	256MB PC133 SDRAM ¹	\$39
Hard Drive	Maxtor 40GB 5400rpm (Refurbished) ²	\$62
Video Card	Integrated	N/A
Sound Card	Integrated AD1881	N/A
Network Card	N/A	N/A
Modem	Integrated Motorola 56K V.90 Fax/Modem	N/A
CD-ROM	Integrated Silver Lite-On 40X CD-ROM Drive	N/A
Diskette	Bundled Silver Mitsumi 3.5-inch Drive	N/A
Monitor	N/A	N/A
Speakers	Two-piece multimedia speakers ⁴	\$14.99
Mouse	Silver Burbie USB Mouse ¹	\$0.99
Keyboard	Silver USB 108 Keyboard (Burbie) ¹	\$3.99
Operating System	Dual Boot: Windows 98 SE COA/License & Linux (ELX) ³	\$39
Software	Video/Modem/Audio drivers CD	N/A
Miscellaneous	Linux CDs	N/A
	Spray paint over sanded areas ¹	\$10
Subtotal		\$301.97
Shipping		\$12.87
Tax		\$1.05
Rebates		N/A
Total		\$315.89

Purchased From:

- 1 Directron.com
- 2 Computer Disk Service
- 3 SWSourcing.com
- 4 CompUSA

CHALLENGE

6.

Nathan Chandler

 Staff Writer
Computer Power User


Nathan

Five hundred bucks to build a PC? My first thought: Must resort to extreme cost-cutting measures.

Start by nixing the case. Instead use twigs, duct tape, and polyurethane foam to protect the parts. Omit pricey P4 and substitute wheel paired with a high-speed gerbil. Replace motherboard with graham cracker to entice gerbil to run. Skip the keyboard and add a fresh legal pad and ballpoint pen.

But then I realized something. Who am I kidding? Past issues have set the precedent: Winning PC Challenge isn't about scraping together the best parts for the lowest price—it's about bribery, rule bending, and RAM. In other words, winning the Challenge is an art form. That said, here's my latest piece. I call it S.A.M.I.T.T. (Seriously Awesome Machine I Threw Together).

You might ask the obvious question: "Why . . . why, the Doggie case?" Just to oblige you, dear reader, and to stick a sharp fork in the eyes rolling in the office, I'll respond to that question: I don't know. I do know S.A.M.I.T.T. has the same orange color of my pup (named Copper) back on Mom's acreage. He's the coolest.

Anyway, as I've never built such a cheapo computer before, I was a bit surprised by the firepower I unleashed in this dawg. I got a great deal on the motherboard/processor combo, and that 700MHz



Monitor not included

AMD (stop snickering) ought to be plenty for a machine of this nature—if you wanted to do DV editing, you'd spend more than 500 bucks, right?

The other components in this puppy are pretty basic. The video card is just OK, but it will still let you play most current multimedia games. The sound card follows suit with its very blunt average-ness. Memory-wise, I initially included only 128MB RAM and discovered that my puppy was rather slow-footed. S.A.M.I.T.T. picked 'em up and put 'em down much faster with his extra 256MB.

My pup's storage space was more impressive. The 30GB Maxtor should be plenty roomy. Plus, the Norcent CD-RW drive was cheap but super effective. It's speedy enough for just about any burning or backup jobs you need to perform.

No, there's no floppy drive or modem. What's your point? Use that extra 20 bucks to buy whatever you want. S.A.M.I.T.T. is more concerned about relevance than such archaic components. And speaking of obsolescence, sorry about your shoes, Samit; my little growler is still breaking in a few teeth.

And The Winner Is . . .

OK class, repeat after me: "Budget" does not mean "mockery of all the technology we hold dear." Sure, \$500 doesn't buy much these days, but I'm still surprised that, faced with this task, both our contestants went the

wacky way. Nathan actually included some good components for the money. S.A.M.I.T.T. has a respectable processor, adequate memory, WinXP Home, and an office suite. But you have to admit that combo seems a little strange when wrapped inside a big orange dog. To make matters worse, this pup has no modem, so on its own, it's stuck in the nonsurfing lane, which puts a crimp in an otherwise fairly productive machine. And even though floppies aren't what they once were, I still would have liked to see that option here. Then there's Burbie, which does have a modem but also has a slower processor, less memory, and a CD-ROM drive instead of Nathan's CD-RW. Still Burbie stays competitive with a (slightly) bigger hard drive and a dual-boot OS. Both of these offerings would work as a cheap system for the kids to cut their teeth on, but with Nathan's system, you'll have to simply describe the Internet to the young'uns unless you slide this system into a connected network, whereas with Samit's system, you can let them explore for themselves. Still, even little tykes will see the speed bump Burbie's slow processor will throw their way. So even though I think Nathan should have spent the money on a modem instead of a CD-RW, I'll give him the win for building a pretty decent machine.


De-Terminator

 Jennie "Haven't Played
With Barbies In Years"
Schlueter

Component	Model	Price
Case	Doggie case with 300W power supply ¹	\$59.99
Motherboard	Shuttle AI61 Slot A with AMD Athlon 700MHz ²	\$69.99
Processor	Integrated	N/A
Memory	128MB PC100 SDRAM ²	\$29.99
	256MB PC133 SDRAM ³	\$43.96
Hard Drive	Maxtor 30GB Ultra DMB 133 5400 ⁴	\$61
Video Card	Albatron TnT2 M64 32MB SDR AGP ²	\$29.99
Sound Card	Vortex AU8820 PCI ²	\$9.99
Network Card	Belkin 10/100 PCI ^{*2}	\$10
Modem	Nope.	N/A
CD-RW	Norcent 40X12X48X IDE CD-RW ^{*2}	\$69.99
Diskette	Nope.	N/A
Monitor	Uh, nope.	N/A
Speakers	Juster 120W Multimedia Speakers ³	\$6.98
Mouse	Three-button Scroll PS/2 3D Mouse ³	\$6.98
Keyboard	DIT Multimedia PS/2 Keyboard ³	\$4.99
Operating System	Windows XP Home Edition (OEM) ⁴	\$85
Software	OpenOffice.org office suite, Ahead Nero 5.5	N/A
Subtotal		\$488.85
Shipping		\$27.78
Tax		\$4.41
Rebates		\$40
Total		\$481.04

* Items with a rebate

Purchased From:

1 Colorcases.com

2 TigerDirect.com

3 DIT Corp

4 Nova Computech

X-ray Vision: Microsoft's Palladium

When it comes to almost anything involving Microsoft, many in the tech industry put on their skeptics' eyeglasses. When you're one of the world's largest companies and you own an overwhelming market share in several areas, such as skepticism comes with the territory.

When Microsoft begins throwing around words like "industry-wide collaboration," "strong security," and "sharing source code," the number of skeptics and their level of skepticism increases. After all, many people view Microsoft as a company that tends to do what's best for Microsoft. And Microsoft hasn't exactly been the king of building secure applications of late.

Microsoft hopes to win over the skeptics by putting together an unprecedented collaboration of hardware and software manufacturers. Microsoft's initiative would bring high levels of security and personal privacy to computer users . . . if the tech giant can pull it off. Microsoft has chosen Palladium as the code name for the set of features that would make data more secure and that would lead to the success of its initiative.

A Security Solution?

With more and more computers connected to the Internet all the time, the need for improved security and reliability in online computer transactions and communications is more important than ever. Providing such protections in new products isn't easy, as developers must continually include backward compatibility with older hardware and software solutions. If they were starting from scratch, developers might have an easier time building strong security into software and hardware, but backward compatibility issues often tie them to problems that are inherent to older products.

Microsoft says Palladium would provide the needed security, along with improved personal privacy. Individual users will have control over their personal data when using the system, letting them share as much or as little information as they choose.

Making it work. Implementation of Palladium will require hardware and software makers to work together. In Microsoft's vision, Palladium compatibility and features would be built into many types of hardware, including microprocessors and networking hardware, and into software, such as operating systems and remote access software. Nearly every segment of the computing process could involve Palladium in some manner.

In its basic form, Palladium would consist of a set of features built into a future Windows operating system, possibly Longhorn. However, it wouldn't be a new operating system; it would work alongside Windows. Other Palladium features built inside the hardware and software solutions would work in conjunction with the Palladium features in Windows to provide the strongest security and privacy possible.

Palladium would remain backward-compatible with older software and hardware solutions, letting them work within a Palladium-enhanced system. New components without Palladium features also should work in a Palladium-enhanced system, according to Microsoft. But older components and new, non-Palladium-enhanced components wouldn't be able to take advantage of Palladium features.

The nexus. Palladium's operations are controlled by software operating in kernel mode in the Windows OS, called the nexus. The nexus works almost like a traffic light, authorizing movement of secure data to and from Palladium-authorized entities.

The nexus uses Palladium to verify the identity of Palladium-enhanced hardware and software. It also determines which components can have access to each type of data, depending on your instructions. The nexus will deny requests from unauthorized components, as determined by Palladium.

Palladium's Key Points

Microsoft says Palladium consists of four categories of features:

Palladium Concerns

Questions about Palladium's function and its level of intrusion surfaced almost immediately following the initiative's announcement. Here are some of Microsoft's answers to common concerns about Palladium.

- Palladium and DRM (digital rights management) are not exactly the same thing. DRM software would run on top of and work in conjunction with Palladium. Palladium itself is not DRM software.
- Non-Palladium-enhanced and non-Microsoft software will still run properly on a PC that uses Palladium. Palladium can't tell Windows which software it can or can't run. But non-Palladium-enhanced software won't be able to use Palladium features.
- Palladium and DRM (digital rights management) aren't exactly the same. DRM software would run on top of and work with Palladium, but Palladium is not DRM software.
- The Windows OS will continue to run non-Palladium-enhanced software and non-Microsoft software, just as it does now. Palladium won't tell Windows which software it should or shouldn't run. Non-Palladium-enhanced software just won't be able to use Palladium features.
- Palladium won't detect and delete illegally copied software. But Palladium could work in conjunction with DRM software to ensure that users follow "fair use" guidelines for content, such as with a purchased MP3 file.
- Skeptics worry criminals or terrorists could use Palladium's powerful security features for illegal activities. Microsoft says it will not voluntarily place a back door in Palladium for use by law enforcement because a back door would carry inherent security risks.

HARD HAT AREA

Curtailed memory. Palladium can segment the main memory, ensuring that each Palladium-enhanced application within memory won't be observed or modified by any other application, including the OS.

Attestation. In this process, Palladium uses a piece of coding to digitally sign data. It also guarantees that a cryptographically identified software stack created the data.

Sealed storage. A Palladium-enhanced application ensures that information is stored securely. It also ensures that the information only is accessible to itself or another authorized Palladium-enhanced application (that is identifiable in a cryptographically secure manner).

Secure input and output. When using Palladium-enhanced hardware and software, any input made through the keyboard or mouse is moved securely to the software. Data moving from the software to the output device moves securely, too.

The Debate

Palladium's promise of improved security sounds great. Implementing will be a little more difficult, though. Intel and

AMD reportedly have agreed to the idea of Palladium and including it in some future chip products, and Microsoft now is working with computer manufacturers.

Although there are many questions about Palladium (see the "Palladium Concerns" sidebar), probably the most prominent one involves whether computer users and hardware and software developers are willing to trust Microsoft with security issues. Skeptics are raising several red flags about Palladium:

Competition is out. Skeptics fear Palladium would cement Windows as the OS of the future, essentially eliminating non-Palladium-enhanced OSes, and that MS eventually could make any non-MS code unable to take advantage of Palladium.

End of TCP/IP. TCP/IP software is the key to moving data around the Internet, and no one owns the software. But skeptics say Palladium would create a new form of TCP/IP that Microsoft would own.

Every bit, every byte. Palladium would digitally secure every bit of data, even bits within your CPU. Skeptics don't like relying on a Microsoft product this heavily.

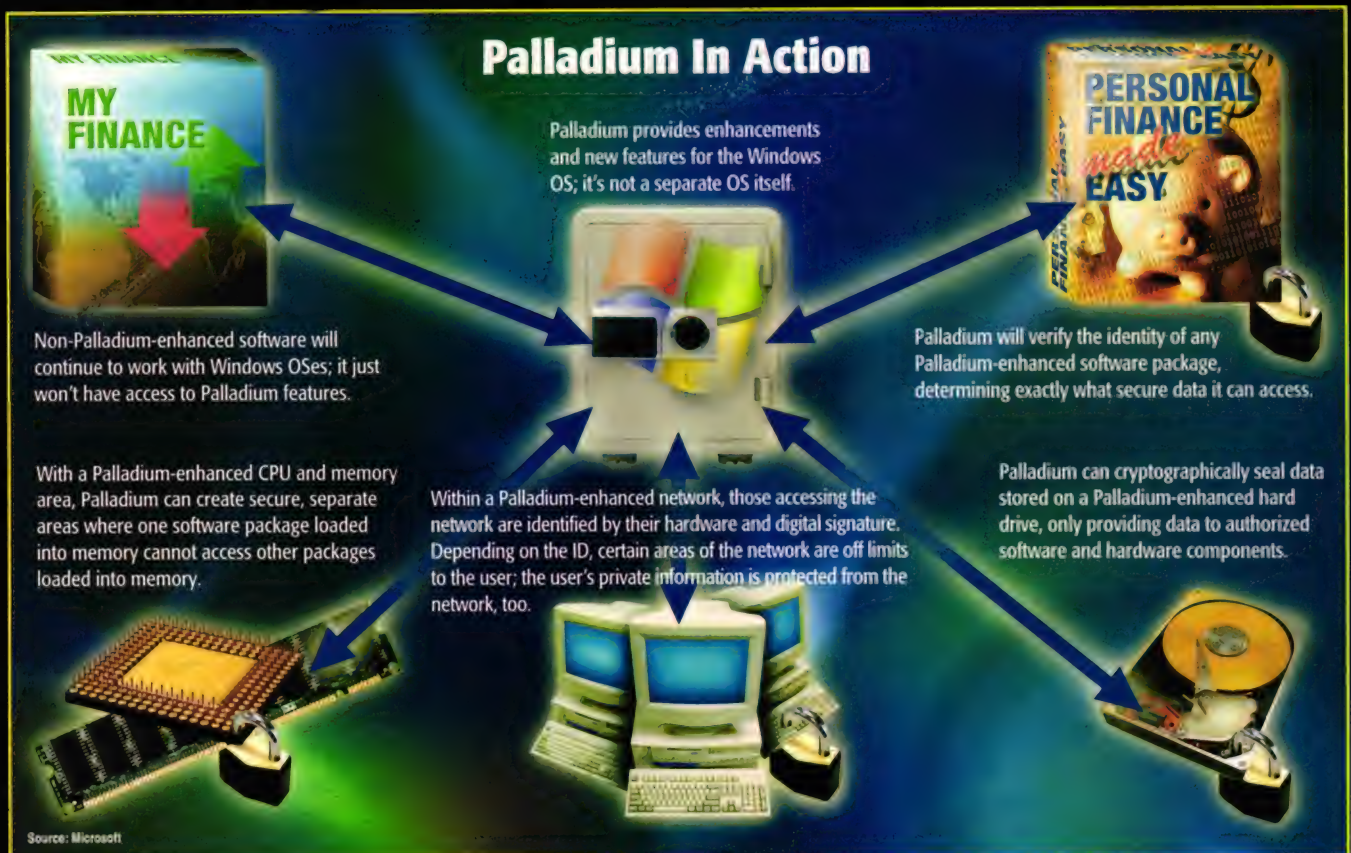
Profits are up. Sure Intel and AMD have signed on, skeptics say: They'll sell more chips as users clamor for Palladium-enhanced CPUs and other hardware.

Although skeptics might question Microsoft's intentions with such a wide-reaching security initiative, some tech experts say the impetus for improving computer security and personal privacy might well require the backing of a big-time company such as Microsoft. Past organizations focusing on these types of security and privacy issues have bogged down as companies have had difficulty working together. Having a company such as Microsoft spearheading the overall effort could actually lead to some progress, some experts say.

Microsoft officials say implementation of Palladium could be a few years down the road. Palladium's success or failure ultimately may rely on Microsoft's ability to prove its worthiness.

by Kyle Schurman

For more Palladium graphics, see www.cpumag.com/cpudec02/palladium.



Serial ATA Moves In

A Speedier Data Transfer Interface Arrives At Last

Here's an understatement for you: Personal computers have undergone several changes and enhancements over the past two decades. Your first PC has very little in common with the PCs you use today. But one area where computers haven't changed much in two decades is the hard drive data transfer interface. Parallel ATA (Advanced Technology Attachment), also called IDE (Integrated Drive Electronics), debuted nearly 20 years ago and has remained the storage interface of choice in PCs. Parallel ATA has undergone improvements to its

specification (letting it greatly increase its data transfer speed over the years, for example), but the underlying technology remains in place.

Parallel ATA has remained viable in part because of its low implementation costs and its ability to meet the needs of storage interfaces in desktop and portable computers. However, parallel ATA hasn't always been able to meet the reliability and performance needs of networked storage and server systems. For the most part, such systems have turned to SCSI (Small Computer System Interface) technology, resulting in higher implementation costs.

Another growing problem for parallel ATA: Its data transfer speeds are no longer always able to keep up with other components and technologies that continually show improvements in speed. Developers are hoping a new storage interface specification, called Serial ATA, can combine the best of parallel ATA and SCSI and will provide the reliability, speed, and cost savings customers need.

The Need For Change

Parallel ATA has been the main technology used to connect internal storage devices almost as long as hard drives have appeared regularly in desktop and portable computers. Ultra ATA is the most current specification for parallel ATA, offering 100MBps data transfer rates. (The initial parallel ATA specification allowed for 3.3MBps data transfer.) Although parallel ATA has remained a viable technology for more than 15 years, thanks to various improvements in the parallel ATA specifications, it is reaching its limitations. To incorporate a parallel ATA bus, designers must create a type of complex board design that is no longer practical. Signal timing requirements under parallel ATA are

also becoming increasingly difficult to properly meet.

Consumers are changing their demands for the hard drive, as well, which is making parallel ATA less practical. In the early days of parallel ATA, consumers most often worked with small files that parallel ATA could move with few bottlenecks. In recent years, though, consumers are working more often with extremely large files, including video and audio files, that push parallel ATA technology to the limit of its data transfer capabilities. Such demands on hard drives for data transfer should continue to steadily increase in upcoming years.

With an eye to the needs of future internal storage device connections, designers a few years ago began working on a new approach, resulting in Serial ATA. With Serial ATA, developers are replacing the parallel bus found in parallel ATA with a serial bus.

Serial ATA is a point-to-point connection that lets multiple ports be implemented into a single controller, usually on the motherboard. Serial ATA provides a data transfer rate of 150MBps for each drive within a disk drive array. However, this rate probably won't be attainable in many systems, at least initially. Systems that must incorporate Serial ATA adapters with a parallel ATA bus will be limited to the maximum data throughput rate for the parallel ATA bus, which will be 133MBps or less.

Nevertheless, designers not only envision Serial ATA as a desktop storage interface technology, but they also see Serial ATA as a viable alternative to SCSI for use in servers and networked storage. Various implementations of Serial ATA will be available, offering varying solutions.

Serial ATA 1.0

Designers have created Serial ATA 1.0 with the idea that it will be the direct

Serial ATA 1.0 Announcements

Several companies made announcements regarding availability of Serial ATA 1.0 products and technologies at the Intel Developer Forum in September 2002.

Adaptec. Demonstrated iSCSI-to-Serial ATA and Fibre Channel-to-Serial ATA solutions for storage networking.

Crest Microsystems. Developed Serial ATA IP platform for next-generation data storage applications.

Fujitsu. Demonstrated a 2.5-inch Serial ATA hard drive for low-end RAID systems.

Intel. Announced a high-performance RAID controller card, employing four Serial ATA disk interfaces.

Maxtor. Announced that 5,400rpm and 7,200rpm Serial ATA hard drives will ship in December 2002.

Philips. Along with Silicon Image and Intel, announced the first demo of an ATAPI device running on Serial ATA.

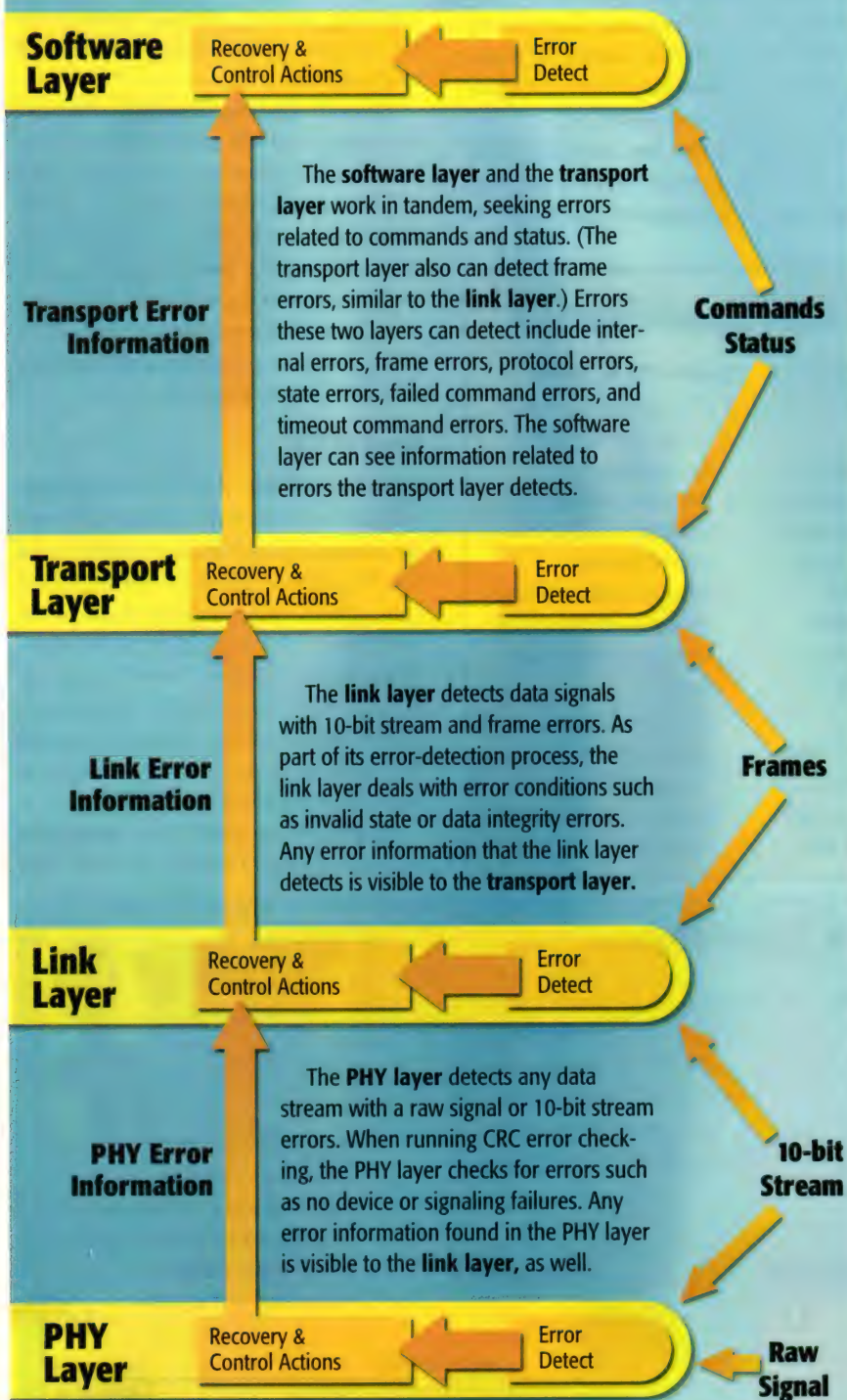
Promise Technology. Announced its first line of Serial ATA controller cards.

Xcelconnex. Announced shipping of Serial ATA cable assemblies. ▲

Serial ATA's Improved Reliability

Serial ATA's design allows for improved reliability at the protocol and interconnect level. Within each layer, Serial ATA allows for use of CRC (cyclical redundancy checking) error detection, which improves reliability by ensuring data integrity. Each layer includes some redundancy in error detection, which improves reliability further.

Protocol & Interconnect Level



replacement for parallel ATA and used mostly in desktop and portable computer systems. Designers kept an eye on the future while creating Serial ATA 1.0 as well, hoping the technology will have a useful lifespan of several years. In addition, Serial ATA 1.0 will provide several direct advantages over parallel ATA.

Improved reliability. Serial ATA 1.0 includes an improved CRC (cyclical redundancy checking) error detection mechanism, allowing for improved reliability over parallel ATA. Although error detection will be a key feature in Serial ATA 1.0, it's expected that networked storage and server markets using future versions of Serial ATA will benefit more from the inclusion of error detection in the technology.

Point-to-point connectivity. With Serial ATA 1.0, each port on the controller serves only one device, allowing it access to the full interface bandwidth and providing access to the system at any time. A parallel ATA system uses shared connectivity, which can't match the speed and performance of a point-to-point connectivity system.

Shrunk cables. Serial ATA 1.0 allows for cables that are smaller in diameter than parallel ATA cables, which reduces clutter inside the computer case and allows for improved airflow. Although the diameter of Serial ATA cables is smaller, the length of the cables is longer at up to 1 meter, compared to the parallel ATA maximum length of 40 centimeters. This extra cable length makes it easier to install drives at the top of a full-tower case. The Serial ATA 1.0 cables also alleviate previous problems with master/slave setups and with terminations.

Smaller signal count. With a reduced signal count, Serial ATA 1.0 allows for a smaller routing area on the motherboard, which helps designers improve the cramped conditions often found in motherboard design.

Support for 2.5-inch drives. Serial ATA 1.0 supports a smaller-sized connector than does parallel ATA, which enables easier support for small form factor internal storage drives, including 2.5-inch drives.

Serial ATA 1.0 also will be backward-compatible with existing parallel ATA drives. (Although Serial ATA 1.0 won't directly interface with parallel ATA hardware, it will be able to make connections via a software interface or via a hardware adapter.) Operating systems should recognize Serial ATA 1.0 in the same manner they now recognize parallel ATA, which should alleviate problems in transition to the new standard.

APT, Dell, IBM, Intel, Maxtor, and Seagate led the development of the Serial ATA 1.0 specification, completed in August 2001. Serial ATA 1.0 products began appearing in the second half of 2002.

Interface Impact

The Serial ATA 1.0 specification should provide direct and indirect benefits in several other areas of the computing industry, too.

Easy to use and afford. Overall, Serial ATA 1.0 should give consumers an opportunity to find lower-cost components that offer greater performance over parallel ATA components. Configuring Serial ATA 1.0 devices should be easier, too, because of the elimination of requirements for jumpers and settings.

Expanded device list. Serial ATA 1.0 not only will provide support for hard drives, but it will support many types of

ATA or ATAPI devices and drives, including CDs, CD recordables, DVDs, cassette tapes, zip drives, and other types of removable storage drives. Even though Serial ATA 1.0 will support a wide variety of devices, it is specifically designed as the primary storage interface within the PC. Designers have not created Serial ATA 1.0 with the idea of replacing current interface technologies for external peripherals, such as USB and FireWire.

Overall system function. Because Serial ATA 1.0 will enable smaller cables and smaller connectors than parallel ATA, system designers will have greater flexibility in creating systems. Serial ATA 1.0 requires lower voltage to operate, as well, making system design easier. Finally, implementation of Serial ATA 1.0 will not require changes to Windows or other operating systems.

Serial ATA II

Although Serial ATA 1.0 should provide more-than-adequate improvements for internal storage device connections for the PC market, the need for backward compatibility with parallel ATA drives will leave Serial ATA 1.0 with some less-than-desirable limitations. Such limitations especially will be noticeable in the server and networked storage markets, which led developers to create a sister specification to Serial ATA 1.0 called Serial ATA II.

At the spring 2002 IDF, developers announced plans for Serial ATA II. The

Evolution Of The Serial ATA Specification

The Serial ATA Working Group continues to guide the evolution of the various Serial ATA specifications.

Serial ATA 1.0

- Provides the internal disk-interface technology for desktop computers, designed to replace parallel ATA
- Offers a data transfer speed of 150MBps
- Specification completed in August 2001

- Products introduced in September 2002

Serial ATA II, Phase I

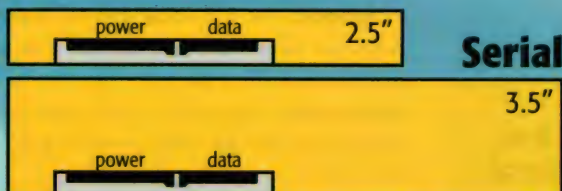
- Provides for expansion of Serial ATA 1.0 specification for use in network storage and server applications
- Provides interconnect solution for racks of hot-swap drives
- Initial specification introduced in September 2002
- First products expected to appear in mid-2003

Serial ATA II, Phase 2

- Provides improvement in data transfer speed to 300MBps
- Provides efficient connectivity for larger numbers of devices
- Provides improvements for high-end networked storage and high-end servers
- Initial specification expected in late 2003
- First products expected to appear in the second half of 2004

Device Connector Sizes & Locations

Serial ATA can support 2.5-inch and 3.5-inch device connectors, while parallel ATA supports only 3.5-inch device connectors. Serial ATA designers were able to shrink the size of the data and power cables in Serial ATA so they are smaller than parallel ATA. Serial ATA also uses a 7-pin data connector instead of the 40-pin data connector used with parallel ATA, letting it fit in a smaller space. Finally, by placing the power and data cable locations in the same place on both the 2.5-inch and 3.5-inch device connectors, Serial ATA lets backplane designers seamlessly select between 2.5-inch or 3.5-inch connectors.



Parallel



Serial ATA's 7-pin data connector makes for a much smaller cable than what was necessary with parallel ATA's 40-pin connector.

SOURCE: SERIAL ATA WORKING GROUP

Serial ATA vs. Ultra ATA

Designers are aiming Serial ATA as a replacement for Ultra ATA. Ultra ATA is an extension of the original parallel ATA technology and remains backward-compatible with it.

The ANSI-supported INCITS T13 committee (www.t13.org) creates revisions to the Ultra ATA specification. The current version of Ultra ATA is ATA/ATAPI-6 (also called Ultra ATA 100), which offers data transfer speeds as fast as 100MBps, but the T13 committee is finalizing the ATA/ATAPI-7 specification (also called Ultra ATA 133), which will ramp the data transfer speeds to 133MBps.

Ultra ATA, because of its roots as a parallel data bus, encounters some undesired analog effects, including crosstalk, ground bounce, ringing, and clock skew. The legacy design that Ultra ATA must follow enhances these

problems, as do further increases in clock speed and data transfer rates. By using low voltage differential signaling and its serial bus design, Serial ATA can avoid many of these analog problems. Low voltage differential signaling calls for transmission of each data signal over two lines. Each line carries an equal but opposite version of the signal. Once the signals reach the decoder, it measures the differential voltage between the two lines to calculate the actual data signal. This process eliminates many of the errors Ultra ATA could encounter.

As part of the migration to low voltage differential signaling, Serial ATA provides several specific improvements and differences from what's available with Ultra ATA.

Bus architecture. Ultra ATA offers a 16-bit wide parallel

data bus. Serial ATA uses a single signal path to transmit data serially (bit by bit) on a two-wire differential pair.

Cabling. Ultra ATA 100 uses an 80-wire cable for data transmission, which is a tremendous improvement over older parallel ATA technologies, such as Ultra ATA 33, which used 40-wire cables that were subject to crosstalk errors.

Clocking. Ultra ATA uses non-interlocked clocking, which is subject to stray noise from the strobe that can interfere with the data signal. The strobe signal (which is equal to the clock signal) travels with the data signal in a noninterlocked clocking design. Serial ATA doesn't use a separate strobe signal; it instead embeds the strobe signal inside the data signal in a process called embedded clocking. Embedded clocking provides continuous synchronization between the

source and the receiver.

Connectors. Serial ATA uses a 7-pin custom connector in a 0.5-inch-wide connector, which eliminates crosstalk problems.

Master/Slave. Ultra ATA supports as many as two drives per channel on a shared bus, referring to them as a master and a slave. Serial ATA supports a point-to-point connection for each drive, allowing each connection to occupy the entire bandwidth. No master/slave jumper switches are needed in a Serial ATA topology, either.

Signaling. Serial ATA can maintain backward compatibility with parallel ATA through software, meaning it doesn't need to maintain 5V compatibility. Serial ATA instead runs at a common-mode voltage of 0.25V, greatly reducing design problems. ▲

For more details, see www.cpumag.com/cpudec02/sata.

spec for Serial ATA II will be a superset of the Serial ATA 1.0 spec. Serial ATA II will appear in two phases.

Phase 1. In the initial phase, developers will concern themselves with the introduction of Serial ATA II, looking to improve the specification's usability in server and networked storage applications. Phase 1 also will provide features that improve performance, including command queuing, out-of-order execution, and out-of-order delivery. Phase 1 will extend trace lengths beyond those offered in Serial ATA 1.0 as well, allowing for a backplane interconnect solution that provides support for hot-swappable drives.

The Serial ATA Working Group announced the release candidate for Phase 1 in September 2002. Phase 1 technology should appear in products in mid-2003. Phase 1 host devices will remain fully compatible with Serial ATA 1.0 drives, but they will require updated drivers.

Phase 2. In the second phase, developers will concentrate on adding features aimed at entry-level and midrange servers. Phase 2 also will include an increase in data transmission speed, increasing from the 150MBps that Serial ATA 1.0 supports to 300MBps for both desktop and server environments. (In a few years, speeds as fast as 600MBps are planned.) Phase 2 will allow for efficient connectivity to many drives as well as support for multiple-initiator networks.

The Phase 2 specification is set for release in late 2003, and Phase 2 technology should appear in products in the second half of 2004. New drivers will be required to allow host devices to take advantage of the Phase 2 technology. APT, Dell, Intel, Maxtor, and Seagate lead the Serial ATA II Working Group, which completed its initial specification in March 2002.

Meeting The Challenge

Ultimately, although Serial ATA will provide some nice enhancements for

desktop systems, its greatest benefits will appear in networked storage and server systems. Serial ATA can provide the high data transfer speeds required for today's large-scale storage systems while remaining cost-effective. Serial ATA-networked storage and server systems also should experience less downtime and improved scalability over previous solutions.

With some Serial ATA products already available, the migration to the new technology is well on its way. Because it's an internal technology, you won't notice Serial ATA's benefits in the same way as you'd notice a new monitor or a faster microprocessor. However, end users and IT managers definitely should notice Serial ATA benefits in two key areas—lower prices and improved performance—from products featuring the new technology. ☞

by Kyle Schurman

room to burn



VINYL



DIGITAL VIDEO



DATA BACKUP



ORIGINAL MUSIC



DIGITAL PHOTO



MP3





Get organized, and take your files with you wherever you go. Burn all your data, video, photography, MP3s, vinyl, cassettes and whatever else you've got to CD with Easy CD Creator® 5 Platinum, from Roxio. The best selling CD burning software in the world. You can even create your own personalized jewel cases for each disc. Hit roxio.com to find out how. Mac® users check out Roxio's Toast® 5.

Now Windows® XP compatible.



by Michael Sweet & Cal Clinchard
Graphics & Design by Jason Codr & Ginger Riley

DREAM PCs

Top-Of-The-Line Systems From The Land Of Nod

We know what you've been dreaming about. It's the same thing we dream about every day: Silicon-enhanced models, and not the kind you see on runways sporting the latest fashion senselessness from Versace and Ralph Lauren. We're dreaming of computers with 3GHz processors, RAID hard drive setups, the fastest video cards, 22-inch monitors, and custom cases.

We're not content to merely dream about such systems, though. We wanted to ogle them first-hand, so we called a bunch of our friends in the business and had them send us a truckload of top systems. Recognizing that one user's dream system could be another's nightmare, we selected a variety of systems to make up our dream team. We included the obligatory exotic/gaming PCs with the latest and best components (and with price tags to match) for those who like to dream big. We also included a few performance systems that, although powerful, are not

geared primarily toward LAN parties and frag fests. Smaller dreams are easier to achieve, so we also found a few dream systems with down-to-earth sticker prices for those with limited budgets. Finally, we added a video-editing dream machine for aspiring directors.

We poked and prodded these systems with a variety of benchmarks, including 3DMark2001SE and the old tried-and-true Quake III. We also ran PCMark2002 and SYSmark2002, so you'll have plenty of ways to size up the systems. You can check out www.smartcomputing.com/cpumag/dec02/dreampc for more in-depth specifications for each machine, as well as a couple of extra systems reviews (an iMac and Panasonic notebook) that we couldn't fit on these pages. For now, don a nightcap (or drink one if you prefer), relax, and get ready for some sweet digital dreams.

EXOTIC/GAMING SYSTEMS

DarkSide PC Hellfire II

The DarkSide PC Hellfire II is a sinister-sounding system with a tough-as-nails look. Bring this AMD-based bad boy to a LAN party, and the other PCs will cower in fear. The Hellfire II uses a VIA KT400 chipset and an Athlon XP 2200+ CPU and includes 512MB of PC3500 DDR SDRAM—an interesting configuration because the motherboard only officially supports up to PC3200 DDR SDRAM. Most of the systems in our dream sequence use ATI's Radeon 9700 video power plant, but the Hellfire II uses a GeForce4 Ti 4600 from OC System. The PC's audio package is similar to that of the other PCs: a Creative Labs Sound Blaster Audigy sound card and a set of Klipsch's ProMedia 5.1 speakers. The Hellfire II's CD-RW drive is a tad



HELLFIRE II

\$3,299 (without monitor)

Darkside PC

(315) 853-3000

www.darksidepc.com

Case Type	Tower
Chipset	VIA KT400
Processor/Clock Speed	AMD Athlon XP 2200+ 266MHz
Memory/Type	512MB PC3500 DDR SDRAM
Hard Drive Manufacturer & Model/Size	Western Digital 120GB 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Mitsumi 32X/12X/40X CD-RW; Toshiba 16X DVD-ROM
Connectivity (Modem/Ethernet)	3Com Etherlink XL 10/100
Video Card Manufacturer & Model/Memory	OC System NVIDIA GeForce4 Ti 4600, 128MB DDR SDRAM
Monitor	22-inch NEC MultiSync FE1250+ (not included)
Audio Card Manufacturer & Model/Speakers	Creative Labs Sound Blaster Audigy; Klipsch ProMedia 5.1
Operating System	WinXP Pro
SYSmark2002 Total Score	204
PCMark2002 Pro CPU Score	5637
PCMark2002 Pro Memory Score	4106
PCMark2002 Pro HDD Score	863
3DMark2001 Score	13,009
Quake III	
1,024 x 768	225.6fps
1,600 x 1,200	160.7fps

slower than you'll find in most high-end PCs, with a write/rewrite/read speed of 32X/12X/40X, but the system does have a 16X DVD-ROM drive and a hefty 120GB Western Digital hard drive.

The Hellfire II's most impressive feature is its VapoChill case. (See the image on page 46.) The case incorporates a large liquid and gas cooling unit (which is kind of like having an air conditioner in your pants), so the PC's internal parts will feel like they're working during a crisp autumn day rather than in the middle of a dog-days-of-summer afternoon. The case is not just functional. It also looks groovy. Think of the song "Shaft." It's a *baaaaaad*. . .

Falcon Northwest Mach V

Falcon Northwest is the ultimate Sandman in the dream PCs market. When you get a Falcon Northwest Mach V, you can be sure it's packed with the best silicon around. The Mach V that Falcon Northwest dreamed up for us boasts an impressive hardware package neatly tucked into a gorgeous customized case.

Falcon Northwest outfitted our Mach V with a 3GHz Pentium 4 CPU and an Intel 82850E chipset. It has a 533MHz FSB and uses 512MB of speedy PC1066 RDRAM. Falcon Northwest rigged our Mach V with a pair of IBM 40GB hard

MACH V

\$3,910 (without monitor)

Falcon Northwest

(888) 325-2661 (541) 552-9169

www.falcon-nw.com

Case Type	Tower
Chipset	Intel 82850e
Processor/Clock Speed	3.0GHz Intel Pentium 4
FSB	533MHz
Memory/Type	512MB PC1066 RDRAM
Hard Drive Manufacturer & Model/Size	IBM Deskstar 40GB 7,200rpm (x 2)
Optical Drives Manufacturer & Model/Read/Write/Rewrite Connectivity (Modem/Ethernet)	Plextor 48X/12X/48X CD-RW; Toshiba 16X DVD-ROM
Video Card Manufacturer & Model/Memory	ATI Radeon 9700 Pro, 128MB DDR SDRAM
Monitor	19-inch NEC FE9915B (sold separately)
Audio Card Manufacturer & Model/Speakers	Creative Labs Sound Blaster Audigy; Klipsch ProMedia 5.1
Operating System	WinXP Home
SYSMark2002 Total Score	282
PCMark2002 Pro CPU Score	7363
PCMark2002 Pro Memory Score	7842
PCMark2002 Pro HDD Score	1513
3DMark2001 Score	15,201
Quake III	
1,024 x 768	314.3fps
1,600 x 1,200	203.1fps

drives connected through a Promise RAID controller, so the system has plenty of storage room and an extra burst of performance. The Mach V has an ATI Radeon 9700 Pro video card that, at least for now, is the best video card you can find. Falcon Northwest placed just as much emphasis on the PC's audio abilities. The system has a Creative Labs Sound Blaster Audigy sound card and



Klipsch's amazing ProMedia 5.1 speakers. The Mach V also sports a Plextor 48X/12X/48X CD-RW drive and a 16X DVD-ROM drive.

The Mach V we received looks as good outside as it does inside, thanks to the CoolerMaster ATC 110 case and a Falcon Northwest Exotix custom paint job. The paint scheme gives the Mach V a cool orange metallic gloss, and it looks simply fantastic. These guys know what they're doing. The case doesn't include a window or lighting effects, something that's becoming prevalent in gaming/high-end systems, but it looks sharp nonetheless.

The Mach V series of PCs have been synonymous with dream systems for years. Carl Jung wouldn't bother interpreting what the Mach V means. He'd simply fire up Doom III and play.

Voodoo E-class

The first thing you'll notice about the Voodoo E-class is that it's red. *Very* red. Specifically, it's Tofosi Red, Tofosi meaning fans of Ferrari, which is the automotive equivalent of the Voodoo E-class PC.

The Voodoo E-class is chock-full of high-performance hardware, including an Intel 82850E chipset, a 3GHz Intel Pentium 4 CPU tapped into a 533MHz

VOODOO E-CLASS

\$5,350 (without monitor)

Voodoo Computers

(888) 708-6636 (403) 264-4530

www.voodoopc.com

Case Type	Tower
Chipset	Intel 82850e
Processor/Clock Speed	3GHz Intel Pentium 4
FSB	533MHz
Memory/Type	512MB PC1066 RDRAM
Hard Drive Manufacturer & Model/Size	Western Digital 80GB Special Edition 7,200rpm (x 2)
Optical Drives Manufacturer & Model/Read/Write/Rewrite Connectivity (Modem/Ethernet)	Plextor 20X/10X/40X/12X CD-RW/DVD-ROM combo
Video Card Manufacturer & Model/Memory	ATI Radeon 9700 Pro, 128MB DDR SDRAM
Audio Card Manufacturer & Model/Speakers	NEC Multisync RE 1250+ (not included)
Operating System	Creative Labs Sound Blaster Audigy; Klipsch ProMedia 5.1
SYSMark2002 Total Score	WinXP Home
PCMark2002 Pro CPU Score	294
PCMark2002 Pro Memory Score	7580
PCMark2002 Pro HDD Score	8012
3DMark2001 Score	1597
Quake III	15,559
1,024 x 768	316.9fps
1,600 x 1,200	198.5fps



FSB and 512MB of PC1066 RDRAM. The horsepower-heavy system is turbocharged by an ATI Radeon 9700 Pro video card. Of course, a sweet machine such as this one requires a good stereo system, so the Voodoo E-Class includes a Creative Labs Sound Blaster sound card and a set of Klipsch ProMedia 5.1 speakers. Our Voodoo E-class includes the "massive speedy hard drive" option, a pair of 80GB

Western Digital Special Edition hard drives connected to a Promise FastTrak RAID controller. The PC also has a Plextor 20X/10X/40X/12X combo CD-RW/DVD-ROM drive.

The Voodoo E-class's fine appointments include a wireless Logitech keyboard and optical mouse, both painted to match the sharp-looking CoolerMaster ATC-710 case. The case sports a pair of

neon lights and Voodoo's Eye Of The Storm window design. The 22-inch NEC MultiSync 1250+ monitor (sold separately for one arm and half of one leg) is also swathed in Tofosi Red.

The Voodoo E-class is the very definition of a luxury power PC. It's made with the best hardware and has the slickest design. You may get speeding tickets just for having it in your home.

PERFORMANCE SYSTEMS

Dell Dimension 8200

Dude, if you gotta have a Dell, the Dimension 8200 is the one to have. This is the company's top-of-the-line model, and it provides 3D performance powerful enough to compete with lower-priced gaming systems. For our review, Dell packed the Dimension 8200 with the best components, so although pricing for the model starts at \$1,069, you'll notice this one comes in at \$2,999.

The Dimension 8200's brain is an Intel 82850 chipset with a 2.53GHz Pentium 4 processor, 133MHz FSB, and 512KB L2 cache. There are four memory slots on-board, and 1GB worth of PC800 RDRAM occupies two of the slots. A funnel-and-fan contraption channels sweet cool air directly to the processor.

For storage, the system has a 120GB Western Digital Caviar hard drive, a Lite-On 48X CD-ROM drive, and a Philips DVD+RW-D01 combo DVD+RW and 32X/10X/40X CD-RW drive. All of this fits in a standard-issue Dell midtower case. Speaking of which, the case has a funky design with a back-end hinge whereby you can open the thing like a book. This actually makes digging in for upgrades a cinch, especially considering the easy-access tabs and clips for fiddling with drives.

The video is pure NVIDIA, baby: a GeForce4 Ti 4600 with TV tuner, which does excellent justice to the Dell 17-inch LCD. A Voyetra Turtle Beach audio card and Altec Lansing THX Certified ADA-995 digital speakers pump out the sound. The speakers have a pod-like design that

adds a unique look to the Dell. Overall, the Dimension 8200 is a solid, reliable machine for office, multimedia, and gaming apps.

Gateway 700XL

If you were to look at the Gateway 700XL specs in a side-by-side chart with those of the Dell Dimension 8200, you wouldn't see many differences. The price tag, for one, is the same at \$2,999 including a 17-inch LCD monitor. There are some subtle differences, however, such as Gateway's use of a Creative Audigy sound card and five-piece Boston Acoustics speakers, which combine to pound out head-knocking bass. There are also some more blatant differences, such as Gateway's incorporation of a Matshita DVD-RAM drive that handles DVD-R/RW media in addition to the colossally capacious 5.2GB DVD-RAM cartridges.

The 700XL we reviewed has an Intel 82801BA chipset that features a 2.52GHz Pentium 4 processor with a 533MHz bus speed and 512KB L2 cache. It has 1GB of PC-800 RDRAM, upgradeable to 2GB. There's a single 120GB Western Digital Caviar hard drive and room for three more. To handle CD burning, the system includes a Lite-On 40X/12X/48X CD-RW drive. One drawback to having a recordable DVD drive is that the read speed is reduced—in this case it's 6X as opposed to an optimal (today, at least) 16X—but we were able to jump through a few chapters of "The Matrix" on DVD with zero glitches or pauses.

DIMENSION 8200

\$2,999

Dell

(888) 799-3355 (512) 338-4400

www.dell.com

Case Type	Midtower
Chipset	Intel 82850
Processor/Clock Speed	2.53GHz Pentium 4
FSB	133MHz
Memory/Type	1GB PC800 RDRAM
Hard Drive Manufacturer & Model/Size	Western Digital Caviar, 120GB, 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Lite-On 48X CD-ROM; Philips DVD+RW-D01
Connectivity (Modem/Ethernet)	Modem; 10/100 Ethernet
Video Card Manufacturer & Model/Memory	NVIDIA GeForce4 Ti 4600, 128MB DDR
Monitor	Dell 17-inch LCD (included)
Audio Card Manufacturer & Model/Speakers	Voyetra Turtle Beach card; six-piece Altec Lansing THX Certified speakers
Operating System	WinXP Home
SYSmark2002 Total Score	240
PCMark2002 Pro CPU Score	6131
PCMark2002 Pro Memory Score	5237
PCMark2002 Pro HDD Score	1053
3DMark2001 Score	11,205
Quake III	
1,024 x 768	249.1fps
1,600 x 1,200	N/A



**700XL****\$2,999****Gateway****(800) 846-4208 (605) 232-2000****www.gateway.com**

Case Type	Midtower
Chipset	Intel 82801BA
Processor/Clock Speed	2.52GHz Pentium 4
FSB	533MHz
Memory/Type	1GB RDRAM PC800
Hard Drive Manufacturer & Model/Size	Western Digital Caviar 120GB, 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Lite-On 40X/12X/48X CD-RW; Matsushita DVD-R/RAM
Connectivity (Modem/Ethernet)	Modem; 10/100 Ethernet
Video Card Manufacturer & Model/Memory	NVIDIA GeForce4 Ti 4600, 128MB DDR SDRAM
Monitor	Gateway FPD1810 18-inch LCD (included)
Audio Card Manufacturer & Model/Speakers	Creative Audigy; 5-piece Boston Acoustics speakers
Operating System	WinXP Home
SYSMark2002 Total Score	251
PCMark2002 Pro CPU Score	6153
PCMark2002 Pro Memory Score	5890
PCMark2002 Pro HDD Score	1114
3DMark2001 Score	11,146
Quake III	
1,024 x 768	260.9fps
1,600 x 1,200	N/A

The 700XL has a dark silver-and-black design, including a minitower case that opens with the push of a button. The bays require no tools, and the mobo has three free PCI slots for handy upgrading. And with a FireWire port and four USB ports (two USB 1.1 and two USB 2.0), the 700XL is ready to work well with external gizmos.

IBM NetVista A30p

When hunting for a high-performance home-use desktop system, it's easy to overlook IBM machines, which traditionally slant steeply toward business users. IBM's new NetVista A30p, however, is an exception. You can find A30p configurations on the company's site that run as low as \$699 and include components you'd ordinarily expect from IBM, or you can configure your own and get a system that does your bidding, whether it be ordinary home/SOHO use or extreme gaming.

We looked at one of the higher-end A30p configurations with an Intel 82845G/GL chipset, a 2.8GHz Pentium 4, a 133MHz bus, a 512KB L2 cache, and 512MB of DDR (upgradeable to 2GB). IBM packed the black, hard-edged minitower box with a Lite-On 40X/12X/40X CD-RW drive, an LG Electronics 16X

DVD-ROM drive, and an NVIDIA GeForce4 Ti 4200 video card with 128MB of DDR SDRAM. The system performed far better in the 3D video category than previous IBM offerings, scoring 9,888 in the 3DMark2001 benchmark.

Another unique point for the A30p is its three-piece Monsoon Planar Media 9 speaker set, which looks small and meek but churns out surprisingly full-bodied sound. DVD movies, audio CDs, and

high-powered games all looked and sounded fantastic on this system. Because the Sound MAX Integrated Digital Audio adapter and NIC are integrated on the mobo, all three PCI slots are free for your upgrade pleasure.

At \$2,249, the A30p is priced to compete with other home performance systems; you can throw in a sharp IBM 15-inch LCD for an additional \$434. The system is backed by IBM's reliable 3-year/1-year (parts/labor) warranty.

Apple Power Mac G4 Dual Processor

The most powerful preconfigured Mac in today's Apple orchard is the Power Mac G4 Dual Processor. The lowest-end configuration costs \$1,699 and includes dual 867MHz PowerPC G4 processors, 256MB of PC2100 DDR SDRAM, and an NVIDIA GeForce4 MX video card with 32MB of DDR SDRAM. However, the configuration that Apple sent us for review is the best you can get before you venture into the customization arena.

At its core, the system has dual 1.25GHz PowerPC G4 processors with a 1.67MHz bus speed that supports a tad more than 1.3Gbps of throughput. It has a 256KB L2 cache, a 2MB L3 cache that provides 4.6Gbps of throughput, and 512MB of PC2700 DDR SDRAM. There's room to quadruple the memory to 2GB.

NETVISTA A30P**\$2,249 (without monitor)****IBM****(888) 746-7426 (914) 499-1900****www.ibm.com**

Case Type	Minitower
Chipset	Intel 82845G/GL
Processor/Clock Speed	2.8GHz Pentium 4
FSB	133MHz
Memory/Type	512MB DDR
Hard Drive Manufacturer & Model/Size	IBM Deskstar 120GB, 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Lite-On 40X/12X/40X CD-RW; HL-DT-ST 16X DVD-ROM
Connectivity (Modem/Ethernet)	10/100 Ethernet
Video Card Manufacturer & Model/Memory	NVIDIA GeForce4 Ti 4200, 128MB DDR SDRAM
Monitor	IBM 15-inch LCD (included)
Audio Card Manufacturer & Model/Speakers	Sound MAX Integrated Digital Audio; 3-piece Monsoon PlanarMedia 9 speakers
Operating System	Windows XP Professional Edition
SYSMark2002 Total Score	246
PCMark2002 Pro CPU Score	6677
PCMark2002 Pro Memory Score	5077
PCMark2002 Pro HDD Score	904
3DMark2001 Score	9888
Quake III	
1,024 x 768	218fps
1,600 x 1,200	N/A



POWER MAC G4 DUAL PROCESSOR

\$3,299

Apple

(800) 692-7753 (408) 996-1010

www.apple.com

Case Type	Midtower
Chipset	N/A
Processor/Clock Speed	1.25GHz Power PC G4 x2
FSB	167MHz
Memory/Type	512MB PC2700 DDR SDRAM
Hard Drive Manufacturer & Model/Size	IBM Deskstar, 120GB, 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Apple Super Drive CD-RW/DVD-RW
Connectivity (Modem/Ethernet)	Modem; 10/100/1000 Ethernet
Video Card Manufacturer & Model/Memory	ATI Radeon 9000 Pro, 64MB DDR SDRAM
Monitor	Not included
Audio Card Manufacturer & Model/Speakers	Integrated audio; Two Apple Pro speakers
Operating System	Mac OS X v.10.2 (Jaguar)
SYMark2002 Total Score	N/A
PCMark2002 Pro CPU Score	N/A
PCMark2002 Pro Memory Score	N/A
PCMark2002 Pro HDD Score	N/A
3DMark2001 Score	N/A
Quake III	
1,024 x 768	N/A
1,600 x 1,200	N/A



For those who haven't grown tired of Apple's translucent case design, the Power Mac G4 midtower case is a looker. Pull a ring on the side of the case, pull it down, and all the internal components are easily accessible. There's good upgrade potential inside with three free PCI slots, three free 3.5-inch drive bays, and one free 5.25-inch drive bay. A 120GB IBM Deskstar hard drive and Apple's own SuperDrive occupy the other bays. The SuperDrive provides decent 8X/4X/24X CD-RW speeds and burns DVD-Rs at 2X.

The system has a sweet ATI Radeon 9000 Pro video card with 64MB of DDR SDRAM, but only integrated audio. The system price doesn't include a monitor, but you can pay anywhere from \$999 (for a 17-inch Apple Studio Display) to \$3,499 (for a 23-inch Apple Cinema Display) to round out this Apple powerhouse.

VIDEO EDITING PERFORMANCE SYSTEM

Sony VAIO PCV-RX790G

Lest anyone charge us with being an exclusionary lot of gaming fiends, we've included Sony's VAIO PCV-RX790G as a stellar example of a system with a purpose. In truth, the system effectively serves other purposes, as well: It's a hub for Sony and other portable devices with two i.LINK (aka FireWire) ports, four USB ports, and a Sony Media Slot; it's loaded with productivity software that typical home users, SOHO users, and students will appreciate; and although it only performs half as well as high-end gaming systems in the 3D category, it performs precisely as well as the usual high-end gaming system did one or two years ago.

Take a look at the system requirements for running a DVD-RW drive and video-editing software, and then take a look at the VAIO PCV-RX790G. The system beats the requirements to offer solid video-editing performance. It has plenty of hard drive space (an IBM Deskstar 120GB drive that spins at 7,200rpm), plenty of brainpower (an

Intel 82850 chipset with a 2.4GHz Pentium 4, a 533MHz FSB, and 512KB L2 cache), and a little more than enough memory (512MB PC800-40 RDRAM). Optical drives include a Toshiba 16X DVD-ROM and an oh-so-sweet Pioneer DVR-104 that covers all the CD-RW and DVD-R/RW bases.

The video card could be better (it's an NVIDIA GeForce4 MX 440) but it's definitely up to the task. The system also sports a TV tuner card with accompanying software and remote control. And, so as not to leave out folks who haven't entered the digital home video age, the system has standard RCA audio/video input jacks.



VAIO PCV-RX790G

\$2,499 (without monitor)

Sony

(888) 595-8246 (941) 768-7669

www.sonymstyle.com/vaio

Case Type	Minitower
Chipset	Intel 82850
Processor/Clock Speed	2.4GHz Pentium 4
FSB	533MHz
Memory/Type	512MB PC800-40 RDRAM
Hard Drive Manufacturer & Model/Size	IBM Deskstar 120GB, 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Toshiba DVD-ROM; Pioneer DVR-104 CD-RW/DVD-RW
Connectivity (Modem/Ethernet)	Modem; 10/100 Ethernet
Video Card Manufacturer & Model/Memory	NVIDIA GeForce4 MX 440, 64MB DDR
Monitor	Sony MultiScan CPD-G410R 19-inch CRT (not included)
Audio Card Manufacturer & Model/Speakers	Integrated Yamaha AC-XG Audio; Sony stereo speakers
Operating System	WinXP Home
SYMark2002 Total Score	215
PCMark2002 Pro CPU Score	5684
PCMark2002 Pro Memory Score	5755
PCMark2002 Pro HDD Score	991
3DMark2001 Score	5747
Quake III	
1,024 x 768	N/A
1,600 x 1,200	N/A

SUB-\$2,000 SYSTEMS

ABS Awesome 3140

The ABS Awesome 3140 is a dream PC because it includes some pretty nice circuitry for little cost. It's the kind of system you can build up over time so you won't have to go broke right off the bat.

ABS slipped a 2200+ CPU in our system. The 512MB of PC2700 DDR SDRAM is standard, as is the ATI Radeon 9700 Pro video card. ABS has to rein in some of the PC's other components to keep this dream within reach of most buyers, so it includes a 60GB hard drive rather than a 120GB drive or a RAID setup. The system also uses an integrated audio chip rather than a sound card, and speakers will cost extra. The Lite-On CD-RW drive is pretty speedy at 40X/12X/48X, and the system also includes a 16X DVD-ROM drive.

The Awesome 3140 is packed in an Enermax server tower case with 10 bays, so it's roomy enough to hold all the system's components plus about 20 cans of Red Bull. The system ABS sent us didn't include a window, but you can switch to a Chieftec case with a window for less than \$5.

CyberPower XP-AV Media Pro

"Dream PC" doesn't have to be synonymous with "big bucks." CyberPower

AWESOME 3140

\$1,090 (without monitor)

ABS

(800) 685-3471 (562) 695-8823

www.buyabs.com

Case Type	Midtower
Chipset	VIA KT400
Processor/Clock Speed	AMD Athlon XP 2200+
FSB	266MHz
Memory/Type	512MB PC2700 DDR SDRAM
Hard Drive Manufacturer & Model/Size	Seagate 60GB 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Lite-On 40X/12X/48X CD-RW; Lite-On 16X DVD-ROM
Connectivity (Modem/Ethernet)	Integrated 10/100 Ethernet; V.92 56Kbps modem
Video Card Manufacturer & Model/Memory	ATI Radeon 9700 Pro 128MB DDR SDRAM
Monitor	17-inch NEC FE770 (not included)
Audio Card Manufacturer & Model/Speakers	Integrated audio; Logitech Z-340
Operating System	WinXP Home
SYSmark2002 Total Score	194
PCMark2002 Pro CPU Score	5387
PCMark2002 Pro Memory Score	4149
PCMark2002 Pro HDD Score	849
3DMark2001 Score	13,227
Quake III	
1,024 x 768	203.2fps
1,600 x 1,200	134.4fps

manages to fill out its XP-AV Media Pro system with excellent hardware, yet the system's price is less than \$1,500.

The XP-AV Media Pro has a VIA KT400 chipset, an Athlon XP 2200+ CPU, and 512MB of DDR SDRAM. The PC's most impressive piece of hardware is the ATI Radeon 9700 Pro. And CyberPower didn't skimp on the system's audio abilities.



The XP-AV Media Pro includes a Creative Labs Sound Blaster Audigy sound card and Cambridge SoundWorks Inspire 5.1 speakers. The Western Digital Caviar hard drive is a roomy 120GB. The system also includes a fast Plextor 40X/12X/40X CD-RW drive and a 16X DVD drive.

The internal hardware is pretty slick considering the system's cost, but CyberPower took an extra step by placing the Media Pro system inside a Thermaltake Xaser II case. The gorgeous silver case has a heavy metal front panel to hide the drive bays and a built-in switch to control the fan speed, a temperature gauge, two USB ports and a FireWire port. CyberPower also carved a window in the XP-AV Media Pro and outfitted our test system with a blue shimmering window light.

The XP-AV Media Pro throws a pretty good punch yet costs less than a rowdy weekend in Vegas (including bail).

IBUYPOWER Night Dreamer XP

Sure, the Night Dreamer XP looks cool, and it's got a relatively low price tag for a high-end system, but do its components offer the stuff that 3D gamers and multimedia heads desire? Pretty much. The 10,565 3DMark2001 score should say it all. Other

XP-AV MEDIA PRO

\$1,539 (without monitor)

CyberPower

(800) 707-0393

www.cyberpowerinc.com

Case Type	Midtower
Chipset	VIA KT400
Processor/Clock Speed	AMD Athlon XP 2200+ (1.8GHz)
FSB	266MHz
Memory/Type	512MB PC3200 DDR SDRAM
Hard Drive Manufacturer & Model/Size	Western Digital 120GB 7,200rpm
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Plextor 40X/12X/40X; Lite-On 16X DVD-ROM
Connectivity (Modem/Ethernet)	RealTek 10/100 Ethernet; Creative Labs V.92 modem
Video Card Manufacturer & Model/Memory	Radeon 9700 Pro 128MB DDR SDRAM
Monitor	ViewSonic E90F 19-inch CRT (not included)
Audio Card Manufacturer & Model/Speakers	Creative Labs Sound Blaster Audigy; Creative Labs Inspire 5.1
Operating System	WinXP Pro
SYSmark2002 Total Score	196
PCMark2002 Pro CPU Score	5450
PCMark2002 Pro Memory Score	4148
PCMark2002 Pro HDD Score	1098
3DMark2001 Score	12,027
Quake III	
1,024 x 768	139.5fps
1,600 x 1,200	124.4fps



systems are cresting the 15,000 mark when faced with this benchmark, but the Night Dreamer XP's gaming performance is reasonable, given that it costs hundreds or even a grand less than top-of-the-line models.

The system's VIA KT333 chipset features an Athlon XP 2200+ with a 1.76GHz clock speed (roughly equivalent to a 2.2GHz P4), a 133MHz FSB, and a 256KB L2 cache. The memory is a little light at 512MB DDR, but the memory only occupies one of three available slots, so you can upgrade to 3GB max. And speaking of upgradeability, this machine has six free 5.25-inch bays and two free PCI slots.

The Night Dreamer XP has two 80GB IBM Deskstar hard drives, an Artec 32X/12X/48X CD-RW drive, and an Artec 16X DVD-ROM drive. The system also has a GeForce4 Ti 4600 with 128MB DDR, which offers analog and digital output but no TV tuner. iBUYPOWER shipped a 19-inch ViewSonic CRT for review with the system, but it sells separately for \$269 and isn't included in the system price. A six-piece set of Creative speakers iced the cake. The Night Dreamer XP proves that manufacturers can build gaming-quality systems without breaking the bank.

Polywell Poly 884RF-2700

Polywell might not have quite the name recognition as other manufacturers in this



NIGHT DREAMER XP

\$1,799 (without monitor)

iBUYPOWER

(888) 462-3899 (626) 281-8262

www.ibuypower.com

Case Type	Midtower
Chipset	VIA KT333
Processor/Clock Speed	AMD Athlon XP 2200+ (1.8GHz)
FSB	133MHz
Memory/Type	512MB DDR SDRAM
Hard Drive Manufacturer & Model/Size	IBM Deskstar, 80GB, Ultra DMA/133
Optical Drives Manufacturer & Model/Read/Write/Rewrite	Artec 32X/12X/48X CD-RW; Artec 16X DVD-ROM
Connectivity (Modem/Ethernet)	Modem; 10/100 Ethernet
Video Card Manufacturer & Model/Memory	NVIDIA GeForce4 Ti 4600, 128MB DDR SDRAM
Monitor	Not Included
Audio Card Manufacturer & Model/Speakers	Creative Sound Blaster Live 5.1
Operating System	WinXP Pro
SYMark2002 Total Score	186
PCMark2002 Pro CPU Score	5317
PCMark2002 Pro Memory Score	3249
PCMark2002 Pro HDD Score	959
3DMark2001 Score	10,565
Quake III	
1,024 x 768	N/A
1,600 x 1,200	N/A

roundup, but it definitely deserves a place among them. The Poly 884RF-2700 has an Intel 82850 chipset with an Athlon XP 2700+ with a 2.17GHz clock speed that performs about as well as a 2.7GHz P4, a 333MHz FSB, and a 256KB L2 cache. There's a nice 512MB of DDR PC3200 taking up just one of three memory slots.

The Poly 884RF-2700 comes with enough office apps and other software to satisfy home and SOHO users, but

combine that with above-average multimedia skills, and you have a college student's dream. The system has twin Western Digital 80GB hard drives plus two empty 3.5-inch bays if you want to add more. Also on board are a zippy BTC 40X/12X/48X CD-RW drive, a Toshiba 16X DVD-ROM drive, and two empty 5.25-inch bays.

Following the trend of most of our high-end PCs, the Poly 884RF-2700 has an NVIDIA GeForce4 Ti 4600 with 128MB of DDR video memory. The audio is pure Creative, with a Creative Labs Sound Blaster Live sound card and a six-piece Creative speaker set that delivers pure Dolby Surround Sound. Combine an easy-access midtower case and three free PCI slots on the mobo and you've got some good upgrade possibilities. The system also has three FireWire ports and four USB ports (two in front, two in back).

In general the Poly 884RF-2700 is a clean, well-lit case (literally; it has blue neon lighting that glows through a side window), and a well-rounded performer for cash-strapped PC dreamers.

At least one (and likely several) of these slick machines should keep you dreaming for a while. We'd have a hard time choosing one system that we'd want to wake up to every morning, so we're not gonna. Take your pick and enjoy the ensuing reverie. ☺

POLY 884RF-2700

\$1,799 (without monitor)

Polywell

(800) 999-1278 (650) 583-7222

www.polywell.com

Case Type	Midtower
Chipset	VIA KT400
Processor/Clock Speed	AMD Athlon XP 2700+ (2.17GHz)
FSB	333MHz
Memory/Type	512MB DDR PC3200
Hard Drive Manufacturer & Model/Size	Western Digital, 80GB, 7,200rpm x2
Optical Drives Manufacturer & Model/Read/Write/Rewrite	40X/12X/48X CD-RW; Toshiba 16X DVD-ROM
Connectivity (Modem/Ethernet)	Modem; 10/100 Ethernet
Video Card Manufacturer & Model/Memory	NVIDIA GeForce4 Ti 4600, 128MB DDR SDRAM
Monitor	Not included
Audio Card Manufacturer & Model/Speakers	Creative Labs Sound Blaster Live 5.1; Creative Inspire 5.1 5300 Home Theater Speakers
Operating System	WinXP Pro
SYMark2002 Total Score	226
PCMark2002 Pro CPU Score	6346
PCMark2002 Pro Memory Score	3937
PCMark2002 Pro HDD Score	1197
3DMark2001 Score	12,481
Quake III	
1,024 x 768	228.1fps
1,600 x 1,200	153.1fps



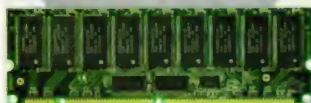


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THE PIECES FOR YOUR NEXT PC

Top Components To Contemplate

The odds of finding a Porsche 911 Turbo under the Christmas tree this year probably aren't good. Finding a PC with enough horsepower to warrant approving nods from savvy hardware enthusiasts isn't as far-fetched, however. Even though high-end computer equipment becomes quickly outmoded, a balanced system should continue to purr long after that Porsche would have needed a new timing chain.

Buying such a new PC can be fun—just enter a credit card number and shipping address and a customized system will be at your front door before you can say, “Happy New Year!” The components will match, and the configuration is a breeze. Manufacturers such as Dell or HP offer conservatively tuned packages that meld performance and reliability, while smaller outfits, such as Alienware and Falcon Northwest, give you a more assertive approach to procuring processing horsepower. But in the end, building a rig from scratch is *always* more fun, not to mention it gives you the ability to tell your friends, “Yeah, I built that.”

To get an idea of what PC components are available this Christmas season, we decided to put together our own “CPU Dream PC,” gearing the respective components primarily toward high-end users. Granted, not all of us can afford every part we've included, but we aimed our

PC to include cream-of-the-crop parts that will be viable well into 2003.

After building the system, we installed Win XP Pro, updated to Windows XP Service Pack 1, and ran several benchmarks, including 3DMark2001 SE build 330, PCMark 2002, SYSmark2002, SiSoft Sandra 2002, Unreal Tournament 2003 demo, Jedi Knight II, and AquaMark. For the most repeatable results, we disabled System Restore and Automatic Update and set the Desktop settings to 1,024 x 768, 32-bit, and an 85Hz refresh rate. We also disabled all advanced window effects for maximum performance. Operating at 333/333MHz, Sandra 2002 reported an average of 2.5GB per second of memory bandwidth. All of the 3D tests returned playable results, even at 1,600 x 1,200. For example, the UT2003 demo recorded

113.9fps in the flyby. Because of the Pentium 4's SSE2 optimizations, it often outperforms the Athlon in content creation applications, but the Athlon XP 2800+ did remarkably well in gaming situations. (For a look at our benchmark scores, see the “CPU Dream PC” sidebar on the next page.)

PROCESSOR

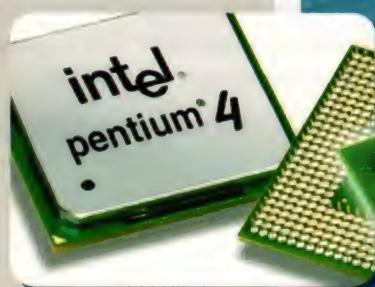
AMD Athlon XP 2800+

(\$397 [in quantities of 1,000]; provided by AMD; www.amd.com)

Intel and AMD have been playing a perpetual game of cat and mouse, with each manufacturer using a different strategy. On one hand, Intel has a very flexible

PROCESSOR

AMD Athlon XP 2800+



architecture with which to work. As a result, the Pentium 4 has a distinct advantage over the Athlon XP in terms of operating frequency. The tradeoff is that the P4 successfully executes fewer instructions per clock cycle, primarily due to its long 20-stage pipeline. Nevertheless, the architecture has aged well. Employing a 533MHz front side bus and 512KB of L2 cache, today's P4 is much better equipped to handle intensive games.

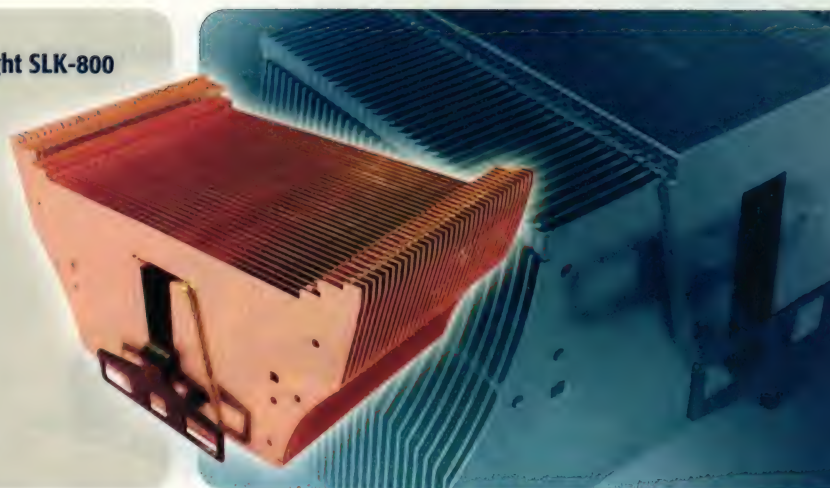
Conversely, AMD's advancements have been met with a little more resistance. For example, its 0.13-micron manufacturing process introduced with the XP 2200+ failed to let its 1.8GHz chip close the performance gap Intel created with its Northwood core. After revisions to its Thoroughbred core, AMD was able to build chips reliably exceeding 2GHz. The most significant specification of AMD's Athlon XP 2800+ flagship is its 2.25GHz operating frequency. Further, the processor is validated to run on a 333MHz front side bus, theoretically capable of transferring 2.7GBps of data. The 2800+ sports 256KB of L2 cache, though AMD plans to release the Barton core early in 2003 with 512KB of cache. Thanks to an efficient 15-stage floating-point pipeline, the 2800+ is often faster than the 2.8GHz P4 in many popular games. It also doesn't hurt that the Athlon costs significantly less.

Intel's ace, though, is a 3.06GHz P4 slated for November. In addition to breaking 3GHz, the chip will introduce HyperThreading, enabling a second "logical processor" on the chip so an OS actually identifies two processors. Consequently, instructions can be executed from two threads at the same time, even though execution resources are shared between both logical processors. But don't expect a massive performance increase immediately, as developers will still need to optimize apps for HyperThreading.

If the 3.06GHz processor had been available, it may have edged out AMD's flagship for our PC. However, at less than \$400, the Athlon XP 2800+ delivers impressive value, as well as phenomenal

Thermalright SLK-800

HEATSINK



frame rates in today's games. Provided that AMD can overcome its supply issues, the 2800+ will be the gaming processor to buy this Christmas. If video editing is your forte, spend the extra money on the P4 3.06GHz, which benefits from SSE2.

HEATSINK

Thermalright SLK-800

(\$49; provided by FrozenCPU.com;
www.frozcpcpu.com)

Athlon processors already have a nasty reputation for failure when cooled insufficiently, so a quality heatsink was of the utmost importance. In fact, AMD maintains a list of recommended motherboards, power supplies, and heatsinks. The SLK-800 hasn't officially received AMD's blessing, but the heatsink's all-copper design does ensure excellent thermal performance by virtue of 34 fins soldered to a narrow heat plate.

Because the heatsink ships without a cooling fan, Thermalright designed the SLK-800 to easily accept 60mm, 70mm, and 80mm fans. FrozenCPU.com recommends the Vantec Tornado 80mm (\$18) for optimal cooling. Spinning at 5,700rpm, the Tornado can move 84.1 cubic feet of air every minute. Be warned, though: The fan is as loud as it is effective. Panaflo's 80mm M1A (about \$12) is an attractive alternative, moving 32cfm but providing a better balance of noise and performance.

MOTHERBOARD

ASUS A7N8X nForce2

(about \$160; provided by ASUS;
www.asus.com)

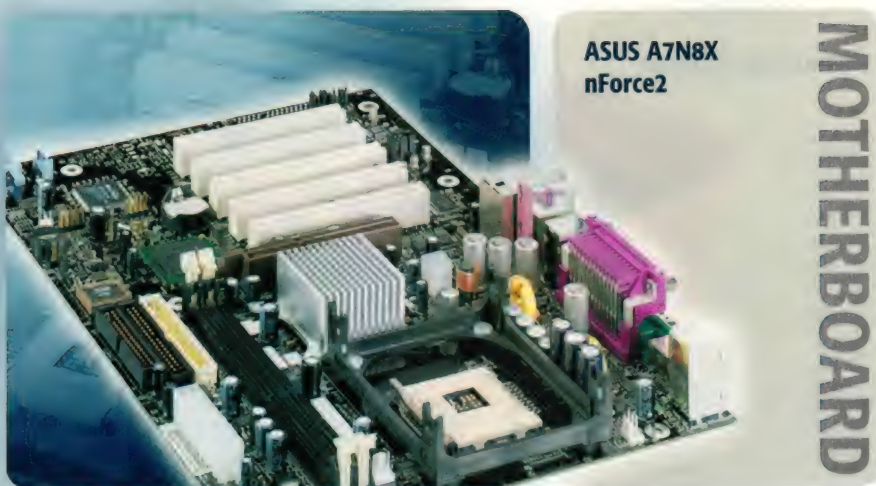
Both the Athlon XP 2700+ and 2800+ are officially rated for 333MHz operation.

CPU Dream PC

Here's how our PC fared in a number of benchmark tests.

3DMark 2001 SE build 330	14,497
PCMark 2002:	
CPU	6,680
Memory	5,009
Disk	948
SYSmark2002:	
Total	242
Content Creation	291
Office Productivity	201
Quake III (1,600 x 1,200)	73.9fps
6xAA 16xAF	
AquaMark (1,600 x 1,200)	45.6fps
Jedi Knight II (1,600 x 1,200)	105.5fps
Serious Sam II (1,600 x 1,200) Elephant Atrium	70fps
Unreal Tournament 2003 Benchmark.exe Flyby (1,600 x 1,200)	113.9fps
Sandra Bandwidth:	
RAM Int. Buffered aEMMX/aSSE	2,567 MBps
RAM Float Buffered aEMMX/aSSE	2,452 MBps
Network Bandwidth Test	From 20 feet connection, speed ranged between 36 and 48Mbps. The transfer of a 670MB file took six minutes.

*Lab notes: All benchmarks were run on WinXP with System Restore and Automatic Update disabled. Advanced performance properties were also adjusted for best performance. In all gaming benchmarks, Desktop details were maximized for best image quality, as a user would typically want to play them.



Of course, the processor requires proper chipset support to operate on a 333 MHz bus. VIA provides this feature on its KT333 and KT400 chipsets, letting the system and memory buses run synchronously. NVIDIA has a similar ace up its sleeve in its nForce2 platform, which many view as a better match to the 2800+.

Drew Henry, NVIDIA's senior director of platform business, attributes nForce2's proficiency to its DualDDR memory architecture. Whereas most manufacturers opt for a single 64-bit memory controller, NVIDIA has implemented two, providing more than 5.3GBps of bandwidth at 333MHz.

"This DualDDR design not only provides the maximum amount of memory bandwidth to the PC—more than double that of single-channel solutions—but the increased bandwidth also ensures that the overall end user experience is improved, especially when they are running multiple applications concurrently, saturating the AGP bus with the latest 3D games, and using multiple USB and FireWire-based digital media devices at the same time," Henry says.

The nForce2 has two main components from which the platform is built. The first component, equivalent to the traditional North Bridge, has been christened the SPP (System Platform Processor). Two of its features include a 333MHz system bus and twin DDR memory controllers. Because the SPP doesn't include a graphics core, such as

the IGP (Integrated Graphics Processor), an external AGP 8X port is provided. Although there currently aren't any applications capable of exposing the benefits of AGP 8X, it certainly does make for an attractive upgrade path with NVIDIA's NV30 on the horizon. Motherboards intended for casual gamers will likely include the IGP, armed with a GeForce4 MX graphics core operating at 250MHz.

Two new MCPs (Media and Communications Processors) have been introduced alongside the SPP. The first is an extension of the MCP that accompanied the original nForce chipset, now with the addition of USB 2.0 and ATA/133 support. There is no Audio Processing Unit as with the original nForce, just an AC'97 codec for basic playback. If you want the bells and whistles, opt for a board with the MCP-T. On top of USB 2.0 and ATA/133, the MCP-T adds FireWire, integrated 3COM 10/100 Ethernet, and the Audio Processing Unit.

ASUS' A7N8X features a combination of the SPP and MCP-T, which is ideal for a high-end enthusiast board. Three DIMM slots offer a maximum memory capacity of 3GB. Two slots need to be populated initially to enable both memory controllers. Standard ATA/133 is supported through a pair of onboard channels, but ASUS has also included Silicon Image's SATALink chip to enable Serial ATA connectivity. The board offers plenty of room for

expansion cards, compliments of an AGP Pro slot, five PCI slots and a single CNR connector. The A7N8X's most interesting aspect is its back panel, which hosts four USB 2.0 ports, two RJ-45 10/100 Ethernet ports, six-channel analog audio output, and a coaxial output for connection to a Dolby Digital decoder.

If the 3.06GHz P4 seems more compelling, consider a mobo based on the new i845PE chipset (about \$140). Intel recently began manufacturing boards designed with hardware enthusiasts in mind, and the D845PEBT2 is the first product to reflect such an initiative. In addition to HyperThreading support, the i845PE is validated to work with the DDR333 memory standard. Like ASUS, Intel chose to integrate the Silicon Image Serial ATA RAID controller with two SATA channels. USB 2.0 is supported natively through the ICH4, while the Agere FW323 controller adds up to three FireWire connections. Analog Devices is responsible for the onboard audio, which includes analog 5.1-channel output, a digital coaxial output, and an optical output.

MEMORY

512MB Corsair XMS3200 SDRAM

(\$97 per 256MB module; provided by AMD)

Although the ASUS A7N8X recognizes DDR400 memory, NVIDIA maintains that the platform performs best when mated to DDR333. Seems counterintuitive, doesn't it? Apparently at 333MHz, aggressive memory timings are used to squeeze the highest performance possible from the chipset. nForce2 is theoretically capable of transferring 6.4GBps of memory bandwidth at 400MHz, but the timings required to maintain stability at that speed aren't tight enough. So, although faster memory modules exist, DDR333 is the best bet for nForce2-based motherboards.

A single module won't do the job, though. Because the nForce2 utilizes two 64-bit memory controllers, both channels

need to be occupied to take advantage of the chipset's capabilities. Corsair's 256MB XMS3200C2 module is well suited for the nForce2 and is also rated for operation at DDR400 speeds, though it functions even better with CAS2 timings at DDR333. The Corsair memory also works with Intel's D845PEBT2 motherboard, albeit at DDR333 speeds. With only one DDR controller, the i845PE chipset utilizes individual modules, and because the board is equipped with two DIMM slots, buy a 512MB DIMM initially, leaving room for an upgrade down the road.

CASE

Aluminum Black Chenming 601 with Window

(about \$160; provided by FrozenCPU.com)

We have the fastest processor, an nForce2 motherboard, and a heatsink that weighs half a kilogram. We didn't want to stow that hardware in a boring beige box, right? Case modding used to be a specialized hobby, but it's evolved to include custom Plexiglas windows, neon lighting, and variable-speed fan controllers. Airbrushing is even available if you want to make a bold statement.

Dimensions for our dream PC weren't really a concern, but a large box full of hardware isn't fun to move around, either. So, we made sure to choose a lightweight aluminum case. If you plan to purchase, say, a DVD drive and CD-RW,

a standard midtower ATX case should work well for expansion.

Chenming's 601 fills the bill for our needs. Measuring 8.1 inches wide x 20.6 inches high x 18.6 inches deep, the 601 isn't exorbitantly large, but it has plenty of room to work inside. Moreover, FrozenCPU.com sells the case with a full-sized Plexiglas window to showcase the system's innards. A phone call to FrozenCPU.com confirmed that it can further customize the Chenming 601 with additional fans (80mm Panaflo fans seem to work well), cold-cathode lighting, and custom wiring. Upon request (and a nominal fee), FrozenCPU.com also works with custom LEDs and cable sleeves. With the addition of a dual-voltage Baybus, the Chenming 601 easily integrates into a bedroom; you can turn the fans to full power during the day and then turn them off at night to eliminate excess noise.

Shuttle (www.shuttlegroup.com) manufactures a miniature alternative to the flashy Chenming, complete with power supply and nForce2 motherboard. The XPC SN41 (less than \$400) measures a scant 18cm high x 20cm wide x 30cm deep, yet offers more features than most full-featured towers do. An integrated GeForce4 MX graphics core powers dual VGA outputs. You may prefer to add an AGP card (up to AGP 8X) for enhanced 3D performance. A single PCI slot is also provided if you decide to add wireless networking capabilities. An optical audio output, three FireWire ports, and four USB 2.0 ports round out the connectivity

MEMORY

512MB Corsair XMS3200 SDRAM



fest. If you're looking to integrate your home theater and PC, the XPC SN41 is an impressive foundation.

POWER SUPPLY

Enermax Whisper 430W

(\$99; provided by FrozenCPU.com)

Hardware components expect specific voltages, so system stability is often dependent on a reliable power supply. No other group seeks stability as fervently as the overclocking community. It takes a lot to tweak a system to its potential, so overclocking enthusiasts rely on high-quality power to run the memory and AGP buses at nonstandard voltages.

Ask any overclocker about his or her power supply of choice and nine out of 10 will mention an Enermax unit. Stan Press of FrozenCPU.com concurs, recommending the 430W Whisper series. In addition to full P4 compliance, the Enermax Whisper monitors the case's thermal statistics and adjusts the speed

CASE Aluminum Black Chenming 601 with Window





of its own cooling fan to combat any internal temperature increase.

GRAPHICS CARD

ATI Radeon 9700 Pro 128MB DDR

(\$399; provided by ATI; www.ati.com)

ATI is like that quiet kid you knew in high school. Back then he couldn't hurt a fly, but years later at your 10-year reunion, it's clear that he means business. First, ATI took the mainstream market by storm with the Radeon 9000. Then, the Radeon 9700 Pro floored gaming enthusiasts. As if that weren't enough, ATI crafted the Mobility Radeon 9000 from its DirectX 8 architecture. Most recently, ATI unveiled the All-In-Wonder Radeon 9700 Pro, a multimedia variant of the flagship 9700 Pro gaming card.

The All-In-Wonder and vanilla Radeon 9700 Pro are based upon ATI's R300 visual processing unit. The massive chip, manufactured on a 0.15-micron process, is composed of no less than 107 million transistors; it's no small feat that ATI has set the core to operate at 325MHz. In short, the card is fully compliant with the DirectX 9 specification, meaning each of the 8-pixel pipelines offers up to 128-bit floating-point precision. Games that are developed around the idea of higher-color precision are still a ways off. However, you will see a marked improvement in today's top 3D titles. ATI's video acceleration has long been recognized as the best, and the Radeon 9700 Pro's 2D clarity is also impeccable.

NVIDIA is struggling to keep pace with ATI's momentum, but that may change when the anticipated NV30 core debuts late in November. Cards based on NVIDIA's own DirectX 9 core are



expected to be available before year's end, but further delays may push the release into 2003. If the Radeon 9700 Pro is too pricey, consider ABIT's affordable Siluro GeForce4 Ti 4200 OTES (\$170; www.abit.com.tw), a liquid-cooled overclocking marvel. Business types may also want to look at Matrox's Parhelia (\$399; www.matrox.com). Although it isn't the fastest 3D card, it does provide support for as many as three displays, which will really knock your buddies' socks off.

SOUND CARD

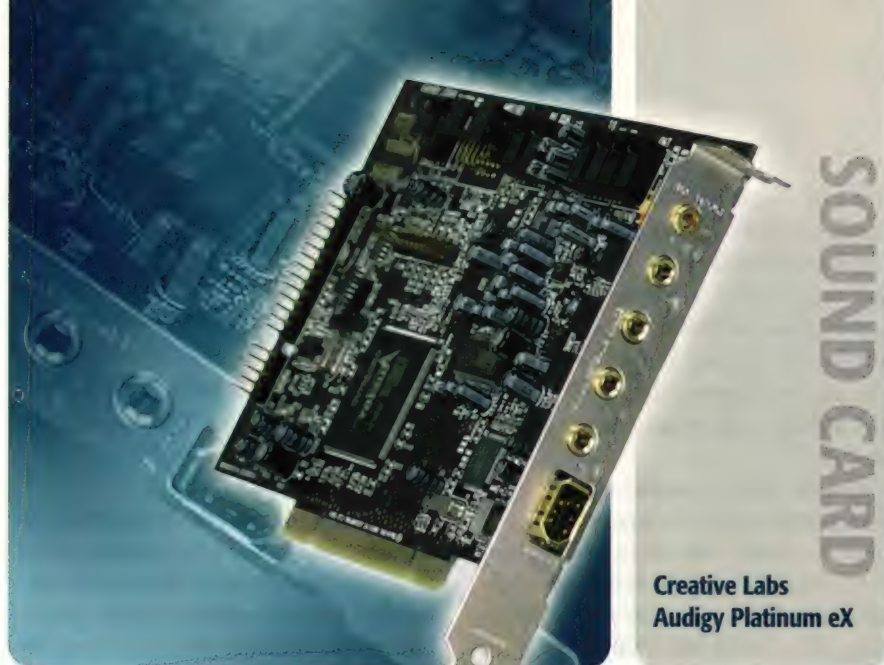
Creative Labs Audigy Platinum eX

(about \$200; provided by Creative Labs; www.creative.com)

The Radeon 9700 Pro delivers a convincing visual experience, both in 3D applications and video decoding, but it can't compensate for a substandard sound system. Games and movies are enhanced by a quality sound card and speaker combination, while music simply requires the pair. Yes, ASUS' nForce2 board does offer analog 5.1-channel output and a digital coaxial connection, but the onboard solution has its limitations. There's only so much room for I/O on the motherboard's back panel or even a PCI expansion card, for that matter.

Creative Labs has found a way around these space constraints by bundling a breakout box with its most powerful sound card, adding optical input and output, coaxial input and output, RCA stereo inputs, an adjustable line/microphone input, an adjustable headphone output, and MIDI input and outputs. Of course, this is on top of the analog 5.1-channel connectors and FireWire port on the back of the card itself.

Creative Labs lists 24-bit audio resolution and a 96KHz-sampling rate as one of the Audigy Platinum's premier quality features. Be careful, though; 24/96 is only attainable through one of the digital outputs (more on this later). In recording situations, the card is capable of 24-bit/48KHz, but the card ends up down sampling to 16-bit anyway.



Nevertheless, the Audigy Platinum eX simply excels in gaming situations, such as *Unreal Tournament 2003*, at full volume. Creative has also built upon its popular environmental effects engine to deliver EAX Advanced HD. In a game such as *Jedi Knight II*, EAX models each room environment as realistically as possible, taking into account obstructions, reverberation, and dynamic occlusions. Because it is entirely possible for more than one environment to influence the way that sound is perceived, the Audigy Platinum is able to process the sum of these effects in real-time, creating unique environmental properties through a feature called Multi-Environment.

Between the card's gaming capabilities and connectivity features, the Audigy Platinum eX is an excellent alternative to the onboard audio the NVIDIA's nForce2 chipset provides. Keep in mind that Creative recently announced the Audigy 2, which supports DVD-Audio playback, Dolby Digital EX 6.1, and an even better signal-to-noise ratio than the Audigy.

SPEAKERS

Klipsch ProMedia 5.1 & DD-5.1

(\$499; provided by Klipsch; www.klipsch.com)

George Lucas' THX audio standard has trickled down from theaters into home audio, and most recently, it's made its way

into multimedia audio. For computer speakers, volume and clarity requirements must be met for a system to receive certification. According to the THX Group of LucasFilm, interface and build quality are also considered.

With the ProMedia v.2-400 in 1999, Klipsch was the first manufacturer to satisfy the requirements necessary for the THX certification. The system boasted 400 watts of power and earned it a reputation for loud, clean sound and powerful, yet defined, bass response. Even more impressive, it did so for less than \$250. Klipsch's ProMedia line has evolved since then and is now available in 2.1-, 4.1-, and 5.1-channel configurations.

The ProMedia 5.1 is rated for 500 watts of power and sports a similar THX seal of approval. Instead of two 6.5-inch drivers, the Pro Media 5.1 subwoofer features a pair of 8-inch side-firing drivers. An upgraded crossover has also been added and is shared

between the 4.1- and 2.1-channel sets. The system is controlled through a digital volume module that allows rear, center, and bass adjustments for fine-tuning.

Features aside, the Klipsch ProMedia 5.1 is recognized primarily for its performance. At normal listening levels, the surround system cleanly blends crisp highs, accurate midrange, and deep bass. Increased volume levels yield similar results. If you want pounding bass, the two 8-inch drivers deliver from inside the ported subwoofer. If you prefer to unwind to classical music, the 0.75-inch tweeters and 3-inch mid-drivers provide a detailed soundstage. In the words of Ferris Bueller, "... it's so choice. I highly recommend picking one up, if you have the means."

The DD-5.1 adds more functionality to the ProMedia system. Sporting RCA, optical, and coaxial inputs, you can connect the Dolby Digital decoder to a PC and PlayStation 2, simultaneously. By pressing a button on the included remote, the input sources change, and you can go from listening to an MP3 to playing *Grand Theft Auto: Vice City*. Plus, the ability to decode an AC-3 audio stream doesn't hurt, either.

NETWORKING

D-Link DI-764 AirPro Multimode 2.4/5GHz Wireless Router & DWL-A520

(DI-764, \$399; DWL-A520, \$159; provided by D-Link; www.dlink.com)

Few things in life rival the look on a friend's face after he has seen wireless



networking in action the first time, be it by the pool or during a LAN party. 802.11b is the most popular standard now, combining affordability with range and performance. Theoretically, the b standard tops out at 11Mbps and can reliably transfer information over 100 to 150 feet of open space. Introducing obstacles reduces the effective range of the 2.4GHz signal, consequently impacting performance.

802.11a isn't as widespread, yet. Equipment based on the a standard utilizes a 5GHz radio frequency to transfer up to 54Mbps. Unfortunately, the parts necessary to build an 802.11a network are fairly expensive. Furthermore, the high-frequency signal is more sensitive to distance, so range is more of an issue.

Contrary to popular belief, you can have your cake and eat it, too. D-Link's DI-764 Multimode router supports simultaneous use of 802.11a and

802.11b. Four 10/100 LAN ports are also available for joining the network via a wired connection. An advanced firewall helps ensure network security and enables content filtering based on MAC address, IP address, and domain name. The package is pricey, but the flexibility that a dual-mode router affords may be worth it.

D-Link offers a complete line of wireless CardBus and PCI adapters to complement the router. The 802.11a-compliant DWL-A520 is an ideal match for high-bandwidth applications, so long as you're using Win 98SE/Me/2000/XP. With roughly 30 feet and a door frame separating the router and PCI adapter, the connection speed between the two devices alternated between 36 and 48Mbps. D-Link's DWL-520+ is a more casual 802.11b adapter that costs significantly less than the A-520 card, though it tops out at 22Mbps.

D-Link DI-764 AirPro Multimode 2.4/5GHz Wireless Router & DWL-A520

NETWORKING

HARD DRIVE

Seagate Cheetah 10K.6 146.8GB SCSI Drive & Adaptec 29160N Ultra160 SCSI Adapter

(Cheetah 10K.6 about \$1,060, provided by Seagate, www.seagate.com; 29160N about \$260, provided by Adaptec, www.adaptec.com)

With the advent of IDE RAID, it seems as though SCSI has lost some of its flair. Admittedly, SCSI drives and controllers often command premium prices, but the performance of a SCSI drive in a data-intensive situation remains unrivaled. Seagate's 10,000rpm Cheetah 10K.6 combines an impressive 4.7ms read time with enormous capacity and an 8MB data buffer. The result when transferring a 512MB file is a performance advantage of nearly 50% over IBM's 7,200rpm ATA-100 drive.

If the \$1,060 estimated street price of the SCSI drive leaves you short of breath, consider a Serial ATA drive instead. You can purchase Seagate's 7,200rpm Barracuda ATA V in capacities up to 120GB, and the SATA cabling scheme is significantly neater than bulky parallel ATA ribbon cable. When SATA drives become available, they shouldn't cost much more than standard parallel ATA drives, either.

OPTICAL DRIVE

Plextor 48/24/48A CD-RW & Lite-On 16x DVD-ROM

(Plextor about \$140, provided by Plextor, www.plextor.com; Lite-On 16x DVD about \$50, provided by Lite-On, www.liteontc.com.tw)

Optical technology has progressed to the point where you can write an entire CD in about three minutes without creating a "coaster." Plextor's 48/24/48A internal CD-RW uses Sanyo's Burn-Proof technology, which lets a CD-RW drive resume recording if the incoming data stream is interrupted. This capability becomes increasingly important for faster drives because a heavily utilized hard drive may have trouble supplying data at the CD-RW's constant linear

HARD DRIVE

Seagate Cheetah 10K.6 146.8GB SCSI Drive



velocity. With a 4MB buffer, the 48/24/48A shouldn't need to recover from many buffer underrun errors, though.

The ability to burn a CD may be useful, but a DVD drive is still necessary to help re-create the home theater experience. With the 48/24/48A on one IDE channel and Lite-On's 16x DVD drive on another, both drives enjoy optimal performance. You'll certainly be appreciative come movie time.

If you'd like a little more flexibility (and you have a few extra dollars), consider Sony's DRU-500A. Not only does the drive read DVD media at 8X and write CDs at 24X, it also writes in four DVD-recordable formats, including DVD-R, DVD+R, DVD-RW, and DVD+RW. That's a lot of compatibility for about \$350.

DISPLAY

NEC MultiSync LCD1920NX 19-inch LCD

(\$950; provided by NEC;
www.necmitsubishi.com)

Unless your PC is plugged into an HDTV via ATI's component output adapter, time spent using the computer will require either an LCD display or a traditional CRT. Both have technical merits and pitfalls, but in the interest of sharp picture quality and a neat desk, the LCD reigns. Gaming purists argue that CRTs can't be beat for their response times, but LCD monitors have greatly improved, and a large 19-inch display such as the LCD1920NX is simply intoxicating. An analog D-Sub connector is provided, but it would be wise to buy a DVI-D connector to interface with the Radeon 9700 Pro. The native 1,280 x 1,024 resolution is also perfect for enabling anisotropic filtering and 6X anti-aliasing with the ATI card.

If a 17-inch display will suffice, consider the NEC LCD1700NX, which also sports digital and analog inputs. Like the LCD1920NX, the 17-inch screen has a native resolution of 1,280 x 1,024, and you can find it for several hundred dollars less.



DISPLAY

NEC MultiSync LCD1920NX 19-inch LCD



In Retrospect

If you go into a computer hardware store today, the performance parts you see on the shelves may very well be in the bargain bin next month. And with the number of components that compose an entire system, there will almost always be something available that's faster, whether it's a new video card or a faster wireless networking standard. The key is to build a solid, well-balanced machine that you'll want to look at for the next year or two.

First, buy a clean-looking case and an adequate power supply. Then settle on a platform that will complement your desired processor. Use quality memory to promote stability and performance.

Invest in a video card that will handle today's games, but also those coming in the next year. Don't get caught with a shoddy sound system, and this includes

a sound card and speakers. If you'll be using more than one computer, choose the networking option that suits your needs, be it wired 10/100 or one of the 802.11 wireless standards.

Gamers will want to pick up a new Serial ATA drive, while video-editing enthusiasts should consider a peppy SCSI setup. Opt for either a CRT or LCD display, whichever appeals to your eyes and wallet.

And finally, try to enjoy the process of piecing together your own dream machine. Not only may it be the envy of your technologically savvy neighbors, but you'll save barrels of cash you would have otherwise spent maintaining that pesky Porsche. 🍷

by Chris Angelini

MAKE A LIST

A Spouse's Guide To A Dream Rig

Building a computer is a lot like following a recipe for pork tenderloin with a lemon-caper sauce. Even if you've never cooked before, success is as easy as following the recipe. First, though, you need to make sure you have the ingredients. The following is a "shopping list" of the ingredients we used to build our PC, in addition to a few alternatives. Understanding that the system is bleeding-edge, some of the components are a tad pricey, so in some cases we included less expensive alternatives.

PROCESSOR

- ☐ AMD Athlon XP 2800+, \$397 (MSRP)
- ☐ Intel 3.06GHz Pentium 4, price unknown

HEATSINK

- ☐ Thermalright SLK-800, about \$49; 80mm Tornado 84 CFM, about \$18
- ☐ Panaflo 80mm M1A fan, \$12

MOTHERBOARD

- ☐ ASUS A7N8X nForce2 (Athlon XP), \$160
- ☐ Intel D845PEBT2 i845PE (P4), \$140

MEMORY

- ☐ 512MB Corsair XMS3200 DDR SDRAM (256MB x 2), about \$100 per 256MB

CASE

- ☐ Aluminum Black Chenming 601 with Plexiglas window, \$109 (about \$250 with 12-inch cold-cathode tube, dual 4-inch cold-cathode tubes under front bezel, 6-port Baybus, custom power, HDD LED, four 80mm Panaflo cooling fans, and black floppy drive)
- ☐ Shuttle XPC SN41, less than \$400

POWER SUPPLY

- ☐ Enermax Whisper 430W, about \$99

GRAPHICS CARD

- ☐ ATI Radeon 9700 Pro with 128MB DDR, \$399
- ☐ ABIT Siluro GeForce4 Ti 4200 OTES with 64MB DDR, about \$170

SOUND CARD

- ☐ Creative Labs Audigy Platinum eX, about \$200

SPEAKERS

- ☐ Klipsch ProMedia 5.1 with DD-5.1 Decoder, about \$499
- ☐ Logitech Z-560 4.1, about \$199

NETWORKING

- ☐ D-Link DI-764 802.11a/b Multimode Wireless Router, \$399; D-Link DWL-A520 802.11a Wireless PCI Adapter, \$159

HARD DRIVE

- ☐ Adaptec 29160N Ultra160 SCSI Controller, about \$150; Seagate Cheetah 10K.6 146.8GB SCSI Drive, about \$1,060
- ☐ Seagate Barracuda V 120GB Serial ATA Drive, about \$180

OPTICAL DRIVE

- ☐ Plextor 48/24/48A CD-RW (black bezel), about \$140; Lite-On 16X DVD (black bezel), \$49

DISPLAY

- ☐ NEC LCD1920NX 19-inch LCD (black case), about \$950
- ☐ NEC LCD1700NX-BK 17-inch LCD, about \$650

THE TOTAL FOR OUR PC: \$5,364. THE SAME SYSTEM WITH SERIAL ATA AND 17-INCH LCD: \$3,782.

NOTE: KINDLY CEASE AND DESIST FROM PURCHASING UNREQUESTED SOCKS, TIES, UNDERGARMENTS, BLENDERS, MOPS, OR ROBES. YOU HAVE BEEN WARNED. NICELY.

stretch your imagination



The CRW-F1 With Exclusive DiscT@2 Technology

The **Ultimate**
CD Recorder

Yamaha's all new CRW-F1 is designed to enhance the style of the contemporary computer workstation. Engineered for easy connectivity via ATAPI, FireWire, USB 2.0 and SCSI, the CRW-F1 delivers reliable performance, high quality and top speed CD recording with whisper quiet operation.

Among its long list of impressive new features, CRW-F1's revolutionary DiscT@2™ Laser Labeling System stands out as the world's only laser based "tattoo" system to etch graphics and text onto CD-R discs, eliminating the need for labels. Next, enter the exclusive new Advanced Audio Master

Quality Recording System and hear Yamaha's studio quality advantage in your own living room. Add in the industry first Ultra Speed ReWrite, the triple-guarded SafeBurn multitasking technology and the exclusive live recording mode, and you will discover why critics herald the new CRW-F1 as the *most complete* CD Recorder in the World!

So, whether you are a PC user or Mac user, let Yamaha CRW-F1's extraordinary features and technologies take you to a world with infinite possibilities and where stretching your imagination is just the beginning...



YAMAHA

The Bleeding Edge Of Software

by Warren Ernst

Inside The World Of Betas

Fortune-telling becomes an exact science when it comes to working with betas. This month we bring you four glimpses into the future of software.

MR Tech Systray 2.10 Beta 4

If you mixed a talented programmer with too much caffeine, you might get MR Tech Systray: a handy utility that combines the functionality of about a dozen utilities into one little program. For renaming MP3s, restarting your computer, cleaning out cache files, and other housekeeping/configuration chores, this app may just be what you're looking for.

MRTS is unassuming at first glance, displaying a little System Tray icon that takes up no CPU time and few resources once it starts. Right-click the icon, though, and a 22-item menu appears that includes seven items relating to shutting down, restarting, logging off, hibernating, and other modes. There's also single-click access to processes that usually require several clicks.

Other menu items include shortcuts to commonly used programs (Calculator, Notepad, Registry Editor, etc.), shortcuts to Windows utilities (Save Screen, Display Properties, Add/Remove Programs), and shortcuts to features that separate utility programs usually provide (Print Screen, Save Desktop Settings, and MP3 Toolkit).

Left-clicking the icon brings up MRTS' main window for even *more* utilities, quick access to the Control Panel, a shortcut lister, Windows tweaks and hacks, MP3 control, and Internet information.

MRTS is free with almost a thousand and one uses, so there's little reason not to give it a whirl. ▲

Official product name: MR Tech Systray
Version # previewed: 2.10 Beta 4
Publisher: MR Technical Solutions
Developer and URL: MR Technical Solutions; www.mrtech.com/mrsystray
ETA: Q4 2002
Why you should care: Lots of handy utilities in one convenient location.

Gorilla 6.5.2 beta

Many of us love how Web pages seem to always display properly in Internet Explorer but hate IE's fairly basic features. This may be why there are so many "IE-plus" products out there that wrap a feature set around the core browsing engine. Gorilla 6.5.2 is one such program.

Gorilla looks like the offspring of IE6 in WinXP with Opera 6. It has XP-like buttons and icons in the toolbar and Opera-like tabs and a Hotlist frame on the left. This

isn't surprising, as Gorilla used to be named IE Opera.

As a browser, Gorilla is very good. It loads quickly and consumes few resources, plus it renders pages as well as IE because, well, it *is* IE in disguise. In addition, the tabs are a browsing godsend. There's a built-in connection to Google's search engine but not a hook into the newsgroup search site. The app has Opera's built-in pop-up window controller, a full-screen mode that still displays tabs (which Opera lacks), and a

cache and cookie cleaner.

Gorilla uses IE's keyboard shortcuts, which aren't exactly intuitive for a multiple-document interface app, but lacks

Opera's more intuitive mouse gestures. Still, Gorilla is a free (donation-ware, really) browser that gives the big boys a run for their money. ▲

Official product name: Gorilla
Version # previewed: 6.5.2 beta
Publisher: Anderson Che
Developer and URL: Anderson Che; www.ieopera.com
ETA: Q3 2002
Why you should care: IE and Opera's happy child.

Send Us Your Betas

Know of software in the beta stage that's deserving of some attention? Let us know. We'll take a look at it and possibly give it a go-around. Send your prospects to bleedingedge@cpumag.com.

Quick Macros 2.0 beta

There was a time when modern OSes came standard with a good macro program. If you miss those days, Quick Macros 2.0 is among the more comprehensive macro programs out there—with several tricks up its sleeve.

QM can read key presses, mouse movements and gestures, and mouse positions absolutely or relative to a window. This allows for such unique options as starting a program by waving the mouse

pointer around the Desktop in a specific way. You can divide the Desktop into regions so the same gesture launches a different program depending on the location.

QM can generate key presses, manipulate windows and apps directly, manipulate the Windows Clipboard, add a floating toolbar to any app for quick macro access, and add/remove menus for many Windows apps. Macros can work system-wide or in one program or in a set of programs.

The macro language is comprehensive and a bit complicated, and the thorough help file could do a better job explaining it all. A Quick Record feature is also somewhat buried, even though it's likely you'll use it often.

For power programmers, QM is about the best macro program I've seen. The only question about QM is its price, which isn't being listed during the beta period. ▲

Official product name: Quick Macros

Version # previewed: 2.0.0 Beta

Publisher: Gintaras Didzgalvis; <http://quickmacros.tinklapis.lt>

Developer and URL: Gintaras Didzgalvis; <http://quickmacros.tinklapis.lt>

ETA: Q4 2002

Why you should care: If you miss macros, say hello to Quick Macros.

PCS Backup Agent 1.0.001 Beta

The perfect backup program would be quick and easy to use and would generate backup files you could restore almost

anywhere, back up network files, break up backup files across media, and work with a scheduling program. By these criteria, PCS Backup Agent isn't perfect, but it's very good.

PCSB generates industry-standard ZIP files with optional password protection. This comes in handy when you need to restore data and all you have is a backup disk because you can almost always find WinZip or PKZIP. PCSB also has a small suite of ZIP file tools, including a file verifier and ZIP to EXE file converter.

There's no automatic media-spanning feature, however.

File-selection tools are simple and effective. You can pick single files or entire folders with a dialog box, which appear on a list as they're selected. You can also pick an FTP site or Web site's URL and back up those files, too. The backup file stores on a local drive by default, but PCSB can log into an FTP site and upload the file for remote storage. For managing FTP connections, PCSB

provides such detailed options as associating specific filename extensions with binary or text FTP-transfer modes, active and passive firewall modes, and timeout lengths.

PCSB lacks command line options and a scheduler, but the program is young; the author plans to include this functionality in the future. ▲

Official product name: PCS Backup Agent

Version # previewed: 1.0.001 Beta

Publisher: Patrick Computer Services

Developer and URL: Patrick Computer Services; www.patrickservices.com

ETA: Q4 2002

Why you should care: Easy backup to a standard file format should interest everyone.

Apple iSync 1.0 beta (v43)

Apple's iSync supposedly offers a universal-sync solution for calendar and contact info over a range of Mac-connected devices. It's a good idea that's poorly executed.

iSync has the usual slick Mac OS X user interface. In minutes we had it set up to sync our calendars from iCal and address books from OS X Address Book into our Palm and iPod units, as well as onto Apple's .Mac Web service. (The .Mac synchronization lets you keep home and office Macs in sync.) The program also syncs with Sony Ericsson's T68 series, T39, and R520 cell phones.

Our events and addresses zipped easily between two

.Mac-connected Macs and onto a Handspring Visor Prism. Events entered on the Palm appeared in a new Unfiled calendar on iCal. Addresses synced successfully to an iPod. Although calendar syncing to the iPod appears in the UI, it doesn't work.

iSync is also agonizingly slow. Syncing a few contacts to a Palm took 15 minutes; adding an iPod added another quarter hour.

If you've become entranced by iCal's colorful bubbles, you're stuck with iSync. Otherwise, stick to Palm Desktop or Microsoft Entourage and give this one a pass. ▲

by Sascha Segan

Official product name: iSync

Version # previewed: 1.0 beta (v43)

Publisher: Apple

Developer and URL: Apple; www.apple.com

ETA: Official release date undetermined

Why you should care: Want to sync iCal? This is your only option

Making The Grade

We Take Image-Editing Apps To Task

There was a time in personal computing history when “graphics capabilities” meant a system had a monitor instead of a Teletype machine. Flash-forward to today and nearly every PC or Mac harnesses enough computing horsepower to make “TRON” look silly. It’s no wonder computers have revolutionized photography, graphics, printing, and about every other facet of life involving images.

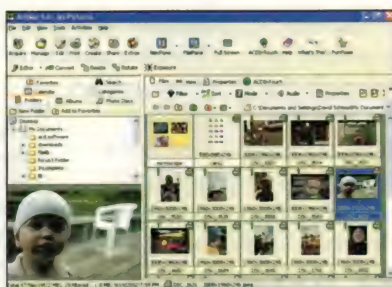
What’s the best way to take advantage of today’s CPU processing power for digital images? Simply pick up a digital-imaging app and have at it. Of course, not all programs are created equal. I’ve selected some of the more popular photo-editing programs and installed them on a 1.6GHz AMD Compaq Presario running Windows XP. In addition, I installed Mac software on an 800MHz Power Mac G4 running Jaguar. I evaluated each package for its speed, ease of use, feature set, built-in support, and compatibility.

ACD Systems ACDSee v 5.0

ACDSee 5.0 has the price of an entry-level program and the look and feel to match. The app sports simplistic but easy-to-use buttons and an uncluttered interface. ACDS is primarily a digital-image importing and management tool that novices and professionals will appreciate for its ease of use and features.

Clicking the Edit button launches ACD FotoCanvas, which is about as bare-bones an editing program as there ever was. Overall, ACDS is the lightest-weight editing program in this bunch, but its powerful digital camera tools make it the right choice as a front end for digital camera power users. ACDS supports the newest camera formats, as well as legacy ones abandoned by other programs.

The app’s strength (if you can call it that) is its image-management tools. It’s



ACDSee v 5.0

\$49.95

ACD Systems

www.acdsystems.com



easy to keep track of photo folders and make contact sheets or send email with just a few clicks. Attachments are low-res JPEG files that are good enough for sharing with your family but not good enough for mission-critical jobs.

New to 5.0 are Calendar and Categories views for more sophisticated image management. A new batch creation tool lets the program create a folder full of thumbnails at once, eliminating the time-consuming task of watching the system create them on the fly.

ACDS’ low price makes it tempting, but it is probably best to leave this one alone. The program isn’t without its merits, though. It is quick and clean and well suited for your mother or grandfather, plus those users who constantly capture images daily.

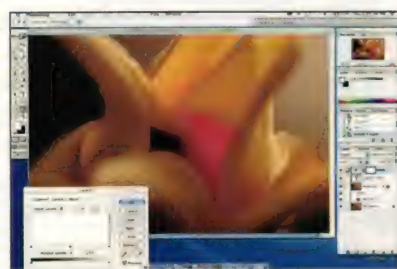
Adobe Photoshop 7.0

Photoshop is the program by which all other image-editing programs are judged. There’s no way to list all of its features here, but suffice it to say, even those who use Photoshop daily, take classes on using it, or

even teach Photoshop classes still probably don’t know everything it can do.

Photoshop not only duplicates (and surpasses) every function of a traditional darkroom, but it’s also the perfect tool for publishing and Web work. The program provides 16-bit editing, a layer and masking interface that leaves other apps in the dust, fully editable layer effects (such as drop shadows and bezels), full support for pressure-sensitive drawing tablets, cross-platform color management tools, plug-in support (with the most robust plug-ins on the market), prepress tools, a fully integrated Web design suite, an image browser, editable text tools, and a new healing brush that makes short work of any photo repair and retouching task. And that’s just for starters.

Photoshop’s strengths, though, are what make it the wrong choice for those who don’t rely on it daily. First, it’s extremely



Photoshop 7.0

\$609

Adobe Systems

www.adobe.com



complicated to use. Second, at \$609, it’s too expensive for some professionals, let alone average consumers. Adobe tackled this dilemma in the past by offering a hobbled Photoshop LE version (more on this later), but Adobe is now taking a different approach. For example, Photoshop’s upgrade pricing is competitive, with new program versions costing about \$150.

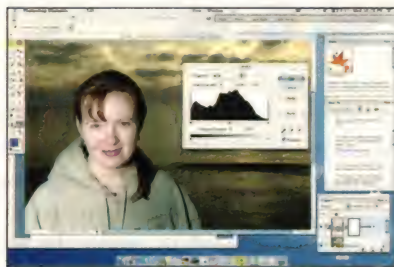
Considering how many new features there are in a given upgrade, that's a steal.

If you're looking for the best solution on the market and have deep pockets, Photoshop is for you.

Adobe Photoshop Elements 2.0

Adobe is well aware that Photoshop's price leaves most people out in the cold. That's why Photoshop Elements was born. For a long time, Adobe sold an LE version, which was essentially the previous Photoshop version at a lower price. The first Photoshop Elements version, however, was based on Photoshop's (then) current version with some high-end features disabled and the interface enhanced for casual users.

To that end, PE 2.0 boasts a streamlined version of the Photoshop interface with an amazing full-time tutorial system and floating Hints palette that provides detailed instructions on using every tool.



Photoshop Elements 2.0

\$99

Adobe Systems
www.adobe.com



A How-To palette uses a recipe metaphor that walks you through common (and unusual) image-editing tasks such as preparing an image for the Web, resizing and cropping, and dozens of other useful ways to modify images. Each step provides detailed instructions, and most provide a "do this step for me" button that lets PE 2.0 carry out complicated tasks. You can even download new "recipes" from Adobe's Web site.

PE has by far the smartest interface of any application I reviewed; it looks much like Photoshop with extra features for

beginners. However, the UI can also be the most complicated to use. There are some 50 buttons on the screen to Photoshop's 20 or so. To be fair, Photoshop requires mastery of multiple palettes, while PE tries to put the necessary tools in front of the user through context-sensitive palettes. Quick Fix is one of the more intelligent buttons, providing easy access to tools for repairing the most common imaging problems.

Once familiar with PE, you'll be able to move up to Photoshop and recognize most tools and controls. Both programs use a handy Palette Well, which is a toolbar area that makes palettes available with a click but keeps them from cluttering the screen. Batch processing and automation features let you edit an entire folder of pictures quickly, and excellent Web tools let you quickly create Web pages you can load to a server.

PE doesn't provide 16-bit support or CMYK tools, and it lacks other high-end functions that make Photoshop more attractive for pros. Still, it provides all of Photoshop's muscle, lacking only some finesse of its big brother at a fraction of the cost. At \$99, PE 2.0 is probably the best bargain in digital imaging today. Adobe sweetens the deal by including a \$30 rebate for registered owners of Photo Elements 1.0 and several other apps.

Jasc Paint Shop Pro Anniversary Edition

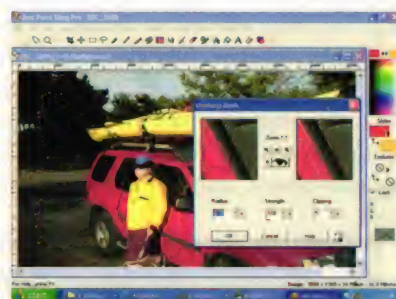
Jasc positions Paint Shop Pro as a high-end, full-featured image-editing program. This is immediately obvious from its 10-pound users manual and bevy of tools and palettes. PSP bundles bitmap- and vector-based image-editing tools into a single program, eliminating trips between multiple programs just to modify a circle or tweak a curve.

PSP's interface is competent but slightly less impressive or intuitive than some packages. Still, it gets the job done, and its snappy response time doesn't leave you waiting. The interface provides multiple palettes, though there's no central location for selecting or storing the handy, necessary tools.

PSP packs a host of built-in effect tools that are helpful to those who tweak images. The interface lets you cut down

many complicated tasks with a quick trip to the menu, while those needing pinpoint accuracy can turn to the program's powerful adjustment tools.

The program supports real-time image preview for any adjustment, though this requires clicking an icon to activate the feature. PSP can edit alpha channels (essential for high-end image editing) and provides a complete suite of adjustment tools from Curves to Gamma Correction.



Paint Shop Pro Anniversary Edition

\$109 (box); \$99 (download)

Jasc Software
www.jasc.com



When it comes to file formats, PSP is a superstar. It can tackle just about anything you'll throw at it, meaning it can double as a file-conversion utility. As an added bonus, PSP bundles Media Center Plus, Animation Shop, and a host of tutorials that nicely round out the package. The program runs on any system from Windows 95 through XP, though Jasc seems to have done little to take advantage of XP's interface.

For serious users, PSP handles most tasks that would normally require Photoshop at a fraction of Photoshop's price. The interface is nowhere near as clean or focused as Adobe's offerings, but it doesn't leave the wallet as light.

Media Chance Photo-Brush 1.9

From the "we're going to make the best program for the least amount of money" category comes this excellent shareware package. As if to prove all other companies charge too much, this \$38 application (an introductory price at press time) packs a

punch that knocks out much of the competition—at least for budget-minded users.

Photo-Brush's smooth interface is more graceful than other packages reviewed here, though it doesn't particularly conform to Windows UI guidelines. Buttons are large (sometimes too large) and well designed, with the icons indicating exactly what the brushes do.

This is fortunate because Photo-Brush uses a painting metaphor for all of its actions. Effects, such as blur and sharpening, are "painted" on an image, as are Urban Art, Thermo, Old Photo, and others. You can paint any effect selectively over any image part with any of a dozen brushes at any size. This is great for working with photos, and it's something many

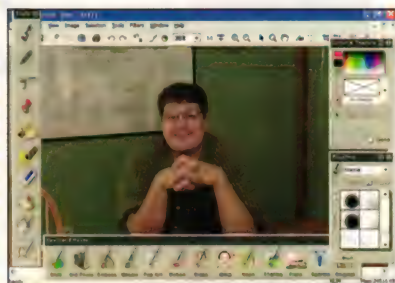


Photo-Brush 1.9

\$38

Media Chance

www.mediachance.com



Photoshop users have been clamoring for. You can also modify images with filters.

The program's Image Nozzle feature is something you'll usually find only in high-end programs. Using it, you can "spray" a pattern out of a predefined image. For example, you can paint borders of flowers around a photo or make a barren tree look like it has springtime foliage.

Photo-Brush also supports brush and paper textures for editing with the look of working on traditional materials (such as canvas), which are techniques only available on much more expensive packages.

Photo-Brush's other more elite features include macros, dust removal, color correction tools, perspective control, and more. There are also image-import

controls and support for EXIF data that digital cameras write.

This is a sharp package at a great price; it's a worthy addition to the image-editing toolbox, even if another application is your primary workhorse.

Microsoft Picture It! Digital Image Pro

When you think imaging, it's unlikely Microsoft leaps to mind. The company isn't exactly known for its digital photography applications. Digital Image Pro is a solid solution for various image-editing needs, however, although it's certainly not the high-octane workhorse other packages in this review are.

Most titles in the Picture It! lineup are little more than variations on die-hard applications such as Print Shop—good for making calendars and banners but underpowered for anything else. DIP, however, includes a suite of photo-editing tools that complement the program's good looks. Not surprisingly, Microsoft's package makes some of the best use of XP's interface with detailed, colored buttons, multipaned interfaces, and other touches that set DIP apart.

Launching the app unleashes a well-thought-out tutorial screen that guides you on tasks from image capturing through exporting. Sadly, the graphics-rich interface is mostly a front end for the built-in help, but the rich explanations are second only to Photoshop Elements in terms of usability.

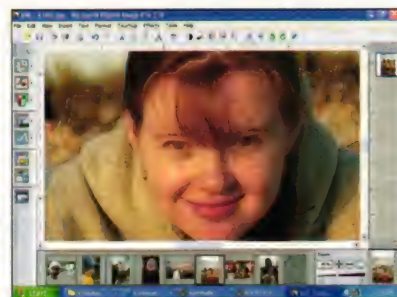
DIP's multipane interface lets you do on-the-fly switching between open images by clicking a thumbnail near the screen's bottom; another thumbnail interface to the right stores layers within an image.

The program can perform numerous common editing tasks with ease, but the tools lack the tweakability of more professional packages. DIP is clearly designed as an adjunct for printing or sharing photographs; it's a snap to change a photo's levels or touch up red-eye. Batch processing is a breeze, but it's impossible to make sophisticated adjustments to an image's curves.

DIP bundles a complete collection of clip art and photographs (a full installation is more than 1GB), which is important because DIP has a secret side: By day, it's a

mild mannered image-capture and editing tool, but by night it's a super-powered graphics creator that can make invitations, postcards, and calendars in a single bound.

Clicking a tool in the palette opens the program's design side, including a full complement of tools for making every sort of print imaginable. This part of the program feels like an entirely separate entity.



Picture It! Digital Image Pro

\$109

Microsoft

www.microsoft.com



In fact, it grew out of Microsoft's other imaging programs. The design area's interface is more simplistic than the image-processing portion, but the difference isn't jarring (only enough to expose the program's roots).

At \$99 there is a lot for casual image creators to love, but those looking for high-powered tools or who want to design greeting cards would do well with other offerings.

Ulead PhotoImpact 8

Ulead may be better known for its multimedia tools, but the different approach that its PhotoImpact 8 takes to image manipulation sets it apart. In addition to a competent (though not groundbreaking) set of photo-editing tools, Ulead has designed a suite of 3D manipulation tools that make this a truly interesting package.

Launching the program spawns a dialog box for importing images—the program can grab files from a camera, scanner, or hard drive—and it can tackle most formats. Image repair and modification tools are plentiful, with such standards as curves

and a histogram present, as well as a healthy smattering of a few more esoteric tools. Most modifications, as well as filters and effects, operate in a dialog box with a Before and After pane that present larger thumbnails for image comparison.



Ulead PhotoImpact 8

\$89 (box); \$79 (download)

Ulead

www.ulead.com



A Post Processing Wizard walks users through the sometimes-complicated task of repairing a poorly scanned image. You can easily straighten images, crop, sharpen, fix red-eye, and more with a few clicks.

Click any 3D tool, though, and the program really kicks into high gear. Creating 3D shapes from simple spheres to complicated text bezels is a breeze. A library of presets is available in numerous floating palettes. As an interesting twist, however, the program can display thumbnails of styles and present elements not installed on the local machine. Clicking a thumbnail of such an element prompts a connection to the company's servers, where you can download the style.

The program's SmartDownloader section has thousands of additional styles, textures, brushes, and more. I downloaded all of them, which totaled more than 760MB.

PhotoImpact not only creates 3D shapes but also lets you map images to those shapes. Designers looking to mock up packaging will love the ability to wrap a photo around a shape. HTML designers can use the built-in Web tools to create pages complete with 3D buttons, textures, and floating objects. One tool even provides verification of the HTML code.

PhotoImpact throws a spin on the image-editing process with a set of tools not usually found in suites. Though the program isn't as powerful as a full 3D-rendering package, it's a comprehensive package

vastly less expensive than most 3D packages. The fact that it's also more than competent at image editing makes it even more valuable. The fact that it's a less-than-\$80 download makes it a steal.

That's A Print

No image-editing program is perfect. Even Photoshop pros sometimes yearn for more than that program offers. Meanwhile, a package that overwhelms a novice photo editor can leave a power user feeling empty. Many graphics pros deal with this problem by purchasing numerous tools for different purposes: Photoshop for most tasks, Photo-Brush for clever effects brushing, PhotoImpact to mock up a new design.

The best image-editing program isn't based on price but on the ability to satisfy the end user. All the programs here will satisfy different users, but each has at least the basic tools needed to turn a poor digital image into a good or great one. ▲

by David Schloss

To read our "Manipulating On The Mac" sidebar, go to www.cpubug.com/cpubug02/mac.

An Eye On Image Editors:

There are more imaging-editing programs on the market than you can shake a stick at. We took a look at seven of the more popular ones. Here's how they compare.

	Features	Pros	Cons	Price	Rating	Contact
ACD Systems ACDSee v 5.0	Image Capture; acquire tools; decent image-editing feature set.	Excellent image-management tools.	Limited editing tools.	\$49.95	2	ACD Systems; www.acdsystems.com
Adobe Photoshop	Professional-level image-editing program with massive feature set.	Serious image-editing tools; considered the standard in any image-editing arena.	High price; steep learning curve.	\$609	5	Adobe; www.adobe.com
Adobe Photoshop Elements 2.0	Gives you Photoshop's interface, plus most of its tools and workflows for a fraction of the price.	Provides most of Photoshop's key features and tools in a prosumer-level application.	Lacks some necessary tools for design and prepress.	\$99	4	Adobe; www.adobe.com
Jasc Paint Shop Pro Anniversary Edition	Professional image-editing tools at a reasonable price.	A challenger to Photoshop in terms of functionality at a bargain-basement price; excellent image-format-conversion tools.	Slightly confusing and cumbersome interface makes accessing some features complicated.	\$109	3	Jasc Software; www.jasc.com
Media Chance Photo-Brush 1.9	Brush-based effect processing makes this editing application stand out.	Great use of interface for artistic image manipulation; excellent price.	Speed is sometimes an issue during effect painting.	\$38	4	Media Chance; www.mediachance.com
Microsoft Picture It! Digital Image Pro	Good editing tools combined with a heavy focus on image printing in calendars, postcards, etc.	Good use of XP's interface; great clip art and photography library; good print tools.	Less powerful than other editors here.	\$109	3	Microsoft; www.microsoft.com
Ulead PhotoImpact	3D editing tools beef up the program's 2D functions.	The only program to integrate 3D and 2D elements at this price point; very nice use of downloaded styles.	3D work requires more horsepower than other applications.	\$89	4	Ulead; www.ulead.com

CPU Ranking: 0 = Absolutely Worthless 1 2 3 4 5 = Absolutely Perfect

Ten For X

For years I sat happily in the Windows camp. When Apple released OS X I watched as a few close friends defected, enchanted by the validity of operating in a non-Microsoft Desktop environment. And before you push the penguin, understand that for people who don't know a cursor from a clipboard, too much choice is as much a downfall as it is a strength. Even Red Hat Linux 8.0's allure isn't enough to woo most folks from a PC-based OS that (mostly) works without worry. But OS X is different, and I'll tell you why.

1. It's elegant. Say what you will about the UI, it's less clumsy and more refined than anything Microsoft has given us. Same holds true for how Finder navigates a computer's contents—at least, in Column mode. Once you get used to it, the dock isn't even that bad.

2. There's plenty of OS X software available. Plenty. If you can't find it at Version Tracker.com, try MacUpdate. And unsanity.com has plenty of haxies to keep me happy. OS X apps are creative in nature, and I often find myself begging developers to code similar Windows programs—Watson from karelia.com and NetNewsWire from Ranchero Software (ranchero.com), for instance. I'll keep my fingers crossed for a decent alternative.

3. It has made personal computing fun again. Sounds campy, but it's true. I really love working with this thing; it's like a new world to conquer.

4. It's as close as some of us want to get to any flavor of *NIX. No OS is without its bugaboos, but a lack of knowledge shouldn't render a system unusable for any period of time. I love tweaking software as much as the next night owl, but I don't want to mess with every God-given setting. I shouldn't have to, either. I love the power, but I also have a life.

5. It's surrounded by a passionate community. I don't agree with a "one ring to rule them all" mentality, but I do appreciate seeing things from a less biased perspective. Before I tried the platform, I was going on blind faith and hearsay. That's not healthy.

6. It would kill Windows if Apple ported it to support Intel processors. That's a bold statement, but I'll stand by it. Nothing else could topple Microsoft's dominance of the PC desktop.

7. Apple gives us only one choice. The more choices one faces, the less inclined you are to act upon any of them. Arguments akin to KDE vs. GNOME or Windows vs. Mandrake are largely unheard of with other OSes. The worst decision most of us face is Windows 2000 or Windows XP. It used to be GUI vs. CLI, but with OS X, either is acceptable. You have choices; they may be limited, but they're far from limiting.

8. OS X will continue to gain industry support. When I plugged my digital video camera in the other day the first time, OS X didn't bat an eyelash.

It's important to note that neither did XP SP1. My point? As newer standards emerge (like FireWire), it becomes less a hassle to operate equipment on either platform. Apart from legacy devices, driver support should only continue to grow. Same holds true for software.

9. It's fast enough for anybody. Although I find the sadly out-of-date Internet Explorer 5.2.2 moving much slower than its Windows equivalent,

I'm sure my mom and dad couldn't care less.

10. There are far fewer digital nasties to contend with. The OS is far from flawless. We've been brainwashed into believing that Microsoft has the least secure OS, but that may not necessarily be true. The tallest nail always gets pounded, and the tide could change on a dime. As reported by vnunet.com (story 1135481), a U.S.-based monitoring group found "485 Linux bugs this year compared to Microsoft's 202." Still, Klez doesn't bother OS X one bit.

Have I made "the switch?" Even with Apple's pitiful marketing campaigns, I still use Windows 99% of the time. Have I been sitting a little too close to the microwave? Perhaps. Color me a curious user who simply found another painless way to play. ■

It would kill Windows if Apple ported it to support Intel processors. That's a bold statement, but I'll stand by it.

Holiday Wish List

1. JVC XV-S500/502 DVD Player
2. ReplayTV 4532
3. 512MB Ultra CompactFlash
4. Pinnacle Studio version 8
5. Diamond Select Jack Skellington Figures
6. Teeccino Refill Kits
7. Hewlett-Packard Jornada CompactFlash Digital Camera Module
8. Hardware Wars DVD
9. The ProScope
10. Canon BP-945 3-Hour Battery

You can dialogue with Chris at chris@cpumag.com.

Season Of Giving



I only hope it's not too late. It's September (as I write this), and I'm already seeing harbingers of the "gift-giving season" in the form of TV commercials that used to be aired only after Thanksgiving.

Take a break from consuming this year, please (do you really need another game console or those rocket-powered rollerblades?), and consider those less fortunate who could really use your help. You know who I'm talking about: the family down the block hit by corporate layoffs, older folks whose pensions have dried up, young people just starting out in an unsettled economy.

Even if everyone you know is in good shape, you surely know worthy organizations: schools, houses of worship, hospitals, charitable and political organizations of all types.

Put down the egg nog and offer something of value to these people and groups. Open-source software makes the perfect gift because it was freely given to the world by those who wrote it. Even with sales of new PCs slowing, you should still be able to scavenge as many serviceable systems as necessary by asking your friends, family, and employers to turn over the systems being used as doorstops.

Here are a few ideas:

- **Broadband router/firewall.** Packet filtering and routing requires relatively little in computer power, so if you can get Linux or BSD to run on a system (from 80286 on up), it should work fine. You don't even need a hard drive, just two network interface cards and a floppy drive. The floppyfw (floppy firewall) distribution is one of many router/firewall combinations; check it out at www.zelow.no/floppyfw.
- **Internet lab.** Does your library have enough Web-surfing stations? Does your school system need more Internet-enabled seats? Perhaps the senior center would like to offer its clients access to email and the Web. Start by collecting the hardware, and then use your favorite distro to install the basic necessities (if the PCs have hard drives). Anything with a Pentium in it should work fine, and don't forget

network and video cards. If your giftees need a Windows interface, you can do so by running Windows as a terminal server and using the VNC (Virtual Network Computing) server and client. VNC is a remote display system that paints your desktop on a terminal from a remote system. You can get details from www.uk.research.att.com/vnc. For more ideas on terminal computing, check out the K-12 Linux Project (k12linux.org) and the K-12 Terminal Server Project (www.k12ltsp.org).

- **Teach with open source.** Try putting together an after-school program to teach kids the fundamentals of programming with open-source tools. All the software is free, and most distros include everything you need. Check the K-12 Linux folks for information and

more links.

- **Stocking stuffers.** Dust off your pile of blank CD-R/RWs and start burning copies of your favorite distro. Consider SuSE (www.suse.com) if you haven't already tried it. For your Linux-using giftees, burn a CD with

Ximian's Evolution (www.ximian.com). Whatever your favorite free program is, if it runs on Windows, burn copies and spread the joy. Be sure to check the terms of the license to make sure you're allowed to distribute the software, and mark all your CDs clearly with permanent markers; get cool colors and let your creativity soar.

Offering open-source solutions to your favorite cause is a good way to get involved in your community. If you're not sure where to start, try asking someone close to you for ideas and pointers. Many organizations have volunteer coordinators who can help get you started.

If you accept the challenge to do good with open source, please let me know what you are doing and how it works. Good luck and happy holidays! ■

Get saucy with Pete at opensauce@cpumag.com.

Holiday Wish List

- 10 A Volkswagen Passat
- 4Motion Station Wagon
- 9 A silent, pocketable \$300 PC to replace my desktop
- 8 For the entertainment and publishing industries to stop trying to milk every last cent from their properties
- 7 Penalize Microsoft for its monopolistic and anticompetitive practices
- 6 Review/revise copyright and patent laws and leave honest users alone
- 5 For TV stations to broadcast "It's A Wonderful Life" as often as possible during November and December
- 4 Respect for, and conservation of, nonrenewable resources
- 3 Freedom for all
- 2 Justice for all
- 1 Peace for all

Offering open-source solutions to your favorite cause is a good way to get involved in your community.

Words From The Web

YEAH, THEY *ACTUALLY* SAID THIS . . .

From an AOL Biker Bar chat room:

**Ain't killed anyone with my cookin',
well gotta be 10 years now.**

Redefining comfort food.

From an MSN

Lobby chat room:

**Ur ugliness
makes me mad.**

Now that's ugly.



From a Yahoo!
Missouri chat room:

**I need to
degrease.**

*You should do that
before you go online.*

[H]ard|Forum post in response to the announcement that McDonald's will stop cooking its fries in delicious, artery-clogging beef tallow:

**McDonald's now has no food at
all that I'm willing to eat.**

You just extended your life by 10 years.

Long Term Storage

The Keo Project (www.keo.org) has a long-term vision: 50,000 years to be exact. Organizers for the project are collecting messages from people worldwide, which will be placed in a satellite time capsule. The satellite will be launched in 2003 and will stay in orbit for 50,000 years, at which time it'll fall back to earth so future generations can read what was on our minds, assuming the entire human population hasn't turned itself into Soylent Green by then.

Anyone can include a message in the Keo Project. Just stop by the site and type in your words of wisdom. You get 6,000 characters (or, as the Project puts it, "4 pages of liberty and equality") in which to spout off about Florida election debacles, current technology trends, the French, what swimwear will be like in 52K2, or whatever wisdom you feel will be especially relevant to our future brethren.

Keo promises not to edit a single word you type, and there's no cost to post your thoughts. My contribution to the Keo Project will include this edition of "Fringe," a recipe for homemade soap, and the starting lineup for the Philadelphia Phillies on the last day of the 2002 season. Oh, and two pages from *CPU* editor Jennie's personal diary. Turns out she has a secret crush on Bob Saget. Hmm, maybe there are some things people in the future shouldn't know about. . . . ▲

Infinite Loop

Don't Bother Me, I'm Working

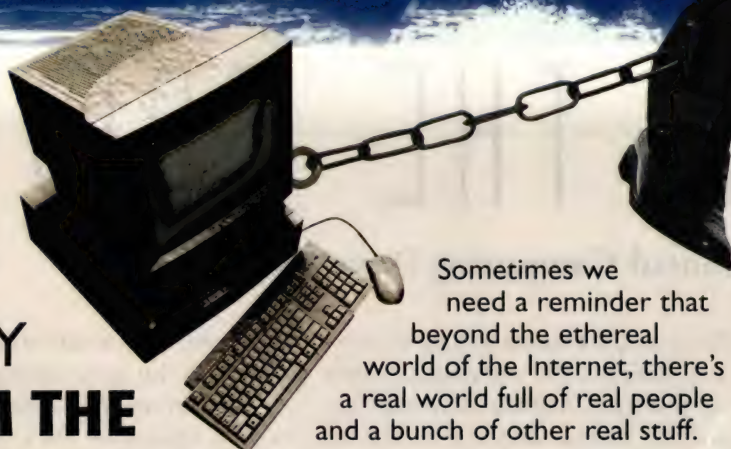
WebSense reports that as much as one-fourth of U.S. employees are addicted to the Internet. Wondering what kind of online research your neighbor is really doing a few cubes away? Here are employee favorites, in order of popularity:

1. Shopping
2. News
3. Pornography
4. Gambling
5. Auctions



Source: WebSense Press Release.
www.wesense.com/company/news/ny02082102.cfm

STEP AWAY FROM THE COMPUTER



Sometimes we need a reminder that beyond the ethereal world of the Internet, there's a real world full of real people and a bunch of other real stuff.

<https://the.ihug.co.nz/>

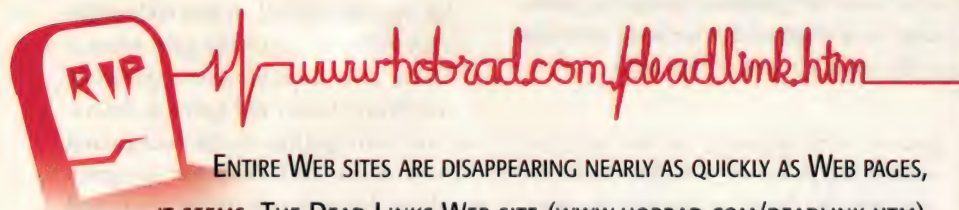
When Good Web Pages Go Away

Like most Web surfers, I hate 404 errors, and not just because the page I tried to access apparently no longer exists. I hate the smugness of the error itself. I hate being teased by a promising link that yields nothing but "File Not Found" in large bold type. These 404 pages, on the other hand, are actually worth checking out.

gaeb.teatime.com/notfound.html

cold-dead-fish.com/404.asp

www.mcsquared.com/error1.htm



ENTIRE WEB SITES ARE DISAPPEARING NEARLY AS QUICKLY AS WEB PAGES, IT SEEMS. THE DEAD LINKS WEB SITE (WWW.HOBRAD.COM/DEADLINK.HTM)

PAYS TRIBUTE TO THOSE THAT HAVE FALLEN—WITH A NICE TWIST OF HUMOR.

HACKER OR NOOB?

TAKE THE HACKER PURITY TEST (WWW.ARMORY.COM/TESTS/HACKER.HTML) TO FIND OUT EXACTLY HOW DEEPLY YOU'VE WRAPPED YOUR LIFE IN A SILICON COCOON. AS IF YOUR DING-DONG-ENHANCED WAISTLINE WASN'T ENOUGH OF A HINT.

"Where's the ANY key?"

Autonomous Ground Vehicle Race

Are you good with tools? I mean really good with tools? If so, DARPA (Defense Advanced Research Projects Agency) has quite a contest for you: the DARPA Grand Challenge Autonomous Ground Vehicle Race, from Los Angeles to Las Vegas, which will take place in 2004 (www.arpa.mil/grandchallenge/index.htm). The winner gets a nifty cash prize, so lock yourself in your basement and start working on prototypes now.

BEACH...



MOUNTAINS...



DESERT...



ENTER THE GRID

Distributed Computing Powers Up

Distributed computing is no longer the arcane, quasi-mystical practice of super-computing research institutions or offbeat Web-based projects for finding the highest prime number or detecting life in outer space. The basic idea of DC, that the unused data, application, and computing resources of many networked machines could be pooled to make virtual supercomputing power, finally grabbed hold in the corporate sector in 2002.

The transmission and engine design groups at Ford Motor Company used to wait until quitting time to run their most complex modeling simulations on the company's large mainframes so that the CPU-intensive apps didn't interfere with everyday computing needs. Traditionally, determining how a slight change in third-gear ratio might alter a car's total performance required an amazing amount of dedicated processor time, sometimes days. Now, the Ford crew can run these models in as little as 15 minutes at any time of the day because they use a "grid" approach from Sun Microsystems that distributes the computing load to spare CPU cycles throughout the company's network of large-scale machines and desktop workstations. "The benefits are just monstrous," says Peter Jeffcock, group marketing manager, Sun Microsystems.

Corporations are perking up to DC because the efficiencies are so obvious, says Dan Powers, vice president of Grid Computing Strategy and Business Development, IBM. At any given moment in most organizations, the real CPU load on most servers is only about 15% and on desktop PCs only about 5%. "Every PC buy is underutilized," says Powers. "It's like hiring an employee knowing that he's only working 15% of the time. There's a lot of dark matter in the enterprise, and companies want to be able to realize that." So the race is on among major vendors such as

IBM, Sun, and Entropia to bring the once-arcanic notion of DC into companies both large and small. And like all entrants into corporate America, distributed computing gets its own new title: "the grid."

Distributed computing is a generic term for several distinct approaches to pooling PC resources, including peer-to-peer, grid computing, and even Web services. The well-publicized SETI@home project uses a

to storage devices and scientific instruments, so that spare computing cycles or resources in any or all of them can work on a given application. On a computer grid, users send job requests to a master or "multischeduler" unit, which monitors all of the available resources on the network and routes the job for processing at one or more places. Agent software goes on every participating resource in the network so that each node reports its availability back to the master. "You can think of grid software as a matching process," Jeffcock explains. "The master maintains two lists: resources and a list of tasks to run. The process is one of matching the tasks with the resources in an appropriate way."

The magic of the machine is its total transparency for the end user. A desktop PC or workstation might always contribute spare processor cycles to the grid until the local user's own CPU demands hit a prescribed level, or that node might only offer cycles to the grid when a screen saver pops up after a period of inactivity. Masters and agents in the system maintain policies in the background for how much idle CPU power any given machine dedicates to grid projects and which jobs take priority.

Proponents of grids claim they are highly resilient because there are multiple copies of the data on the network. The master system tracks all of the processes that occur on the network so that if brain-dead Brad in accounting crashes his PC while a grid task is being run in the background, the master knows where the interruption occurred so that it restarts the task on another machine.

Grid computing is in its early stages within corporations, but Jeffcock says that Sun alone has deployed 6,000 enterprise grids so far, with 70 more going live each week. In fact, distributed systems have been in place for years at Texas Instruments, the U.S. Department of Defense, and NASA.

The screenshot shows the 'ENTROPIA DCEngine' window. It has a menu bar with 'File', 'Edit', 'View', 'Tools', 'Help'. Below the menu is a toolbar with icons for 'New', 'Open', 'Save', 'Print', 'Find', 'Refresh', 'Stop', 'Start', 'Pause', 'Resume', 'Cancel', 'Help'. The main area is a table titled 'Job Queue' with columns: 'Job ID', 'Job Name', 'Status', 'Priority', 'Created', 'Modified', 'Owner', 'Machine', 'CPU', 'Memory', 'Disk', 'Network', 'Status', 'Error'. The table contains several rows of job data.

The administrative front end for Entropia's Grid software, the DCEngine, presents a queue of jobs that are being run on the distributed computing system, including the applications that are being distributed across the network as well as their status.

peer-to-peer approach to combine the computing power of 500,000 volunteer users over the Web. In searching for signs of life in the cosmos, the project analyzes massive amounts of radio telescope signals that it monitors from space for evidence of intelligent patterns. Because the project is highly modular, SETI@home sends packets of work units to individual PCs, which dedicate spare CPU cycles to their analysis. The aggregated effect amounts to a staggering 1,200 years of processing time every 24 hours.

Grid Computing

"We like to think of 'the grid' as distributed computing on steroids," says Powers. Much like its namesake, an electrical grid, this approach pools all of the resources on its network, from servers and desktop PCs

Entropia's DCGrid 5.0, the Sun ONE Grid Engine, and Platform's Platform LSF are among the more popular grid systems now available for enterprises large and small. Research group Gartner estimated the grid market at a relatively modest \$150 million in 2001 but with an annual growth rate of 50% in the future. For now, companies and institutions with computer-intensive operations are looking to this flavor of DC for help: pharmaceutical labs that need to model new drugs, research institutions working on genetic sequencing and protein analysis, and manufacturers that run mechanical simulations such as virtual auto crash analysis.

At Your Service

DC got a substantial boost this past year as many software manufacturers agreed to support the OGSA (Open Grid Services Architecture), a set of open standards for creating and linking grids over the Internet. Proposed by a consortium of leading distributed computing

innovators, the Globus Project (www.globus.org), and IBM, OGSA sets down a standard set of Java, XML, and WSDL protocols for performing any grid's basic functions: authenticating users, resource

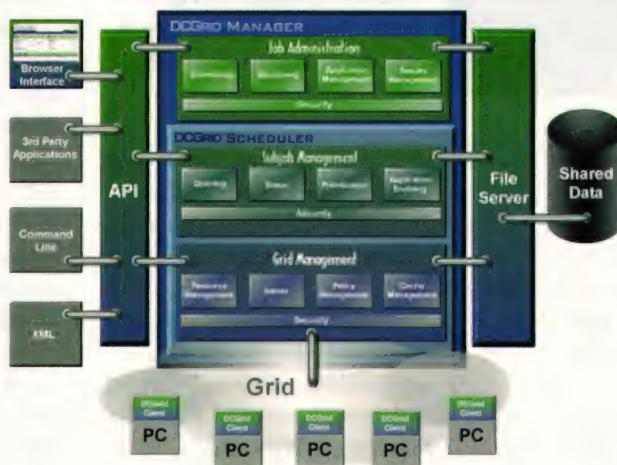
management, problem determination, and communicating with other grids. By moving the grid concept onto the Web with the same kind of standardization that made the TCP/IP protocol the engine that made Web use possible for everyone, the Globus Project represents the next big step for DC.

Bringing grids to the Web is where distributed computing not only opens up whole new worlds of processing power to companies, institutions and governments, but where it also helps us develop previously unimaginable applications that rely on data sets from around the world. For example, the University of Pennsylvania and IBM are using interconnected grids to form a massive database of mammograms from hospitals nationwide. The digitized X-rays will reside on individual hospital servers and some centralized storage hubs that are interconnected via a grid so that doctors and researchers will access the images as a single database.

With this amount of data and processing power available at once, applications can analyze any single mammogram in relation to many others, letting doctors detect problems much earlier in the disease process.

The next stage in grid development could affect each of us every day by turning the Internet itself into a computing platform. According to Dr. Irving Wladawsky-Berger, vice president for Server Group Technology and Strategy, IBM, DC leads to making the Web a virtual PC in which your data, apps, and processing power exist across a distributed network instead of on a local PC. "That vast aggregation of resources is clearly much, much, much richer than anything you would find in a single computer, even a very large server," he said at a consulting summit late last year.

Ultimately, both for companies and consumers, this "on-demand" model morphs computing into a utility much like water and electricity: You flick a switch and draw what you need. Rather than buy new machines to handle workload spikes, a



This image shows the involved architecture of a grid. Entropia's DCEngine can accept job requests remotely from a Web browser and also work with a variety of third-party software. The program's manager and scheduler orchestrate the complex tasks of dividing, monitoring, and reporting on the jobs, which themselves are being distributed from a central file server and out to a network of PCs for simultaneous execution. *Photo courtesy of Entropia*

Buddy, Can You Spare A CPU Cycle?

Peer-to-peer distributed computing projects are in full bloom on the Web as many groups now vie for your spare CPU cycles. From generating disease cures to finding extraterrestrials or just computing the highest prime number, these ventures create supercomputing power out of thousands of volunteers and their PCs' idle time.

distributed.net (www.distributed.net). This DC network conducts "challenges," in which dense cryptographic problems are deciphered in packets sent to individual users and their

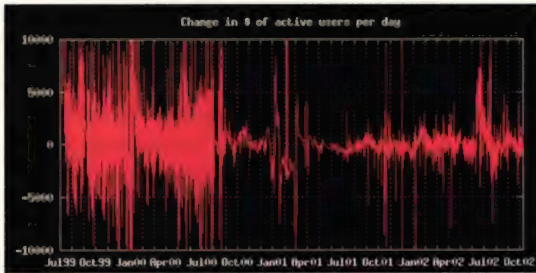
machines. The volunteer whose PC cracks the problem wins notoriety and occasionally cash.

GIMPS (www.mersenne.org/prime.htm). The Great Internet Mersenne Prime Search is looking for the highest example of a special variety of prime number. Online since 1996, GIMPS discovered five such primes, one of which has more than 4 million digits. There is a \$100,000 reward posted for the user who finds a prime with 10 million digits, so you had better get that P4 cranking.

Google Compute (toolbar.google.com/dc).

Everyone's favorite search engine adds a distributed computing option to its popular plug-in, which allows Google searches from the browser toolbar. Activate the feature, and your PC's spare cycles contribute to the Folding @home project (folding.stanford.edu), which maps proteins in order to discover disease cures.

SETI@home (setiathome.ssl.berkeley.edu/index.html). The mother of all DC projects sends radio telescope records to nearly 500,000 users, whose PCs analyze the records for signs of intelligent life. ▲



Distributed computing project SETI @Home is scanning radio telescope signals for signs of intelligent life in the cosmos, and it parses out the job across hundreds of thousands of volunteer computers around the world. This chart tracks the percentage change in active users working on the project day to day.

company would lease increased processing power, data storage, or specialized apps from suppliers such as IBM or Sun or Microsoft, all available from a grid and over the Web. "Most people don't buy the whole ham," says Powers. "What you want to do is build services in very thin slices: what you need now."

Imagine grids dedicated to online gaming, personal finance, or streaming entertainment. Consumers would turn on and pay for only the bandwidth they want but never suffer performance or storage limitations because the workload is distributed among thousands of connected servers. The grid could cure site slowdowns or even denial of service attacks

because the distributed network would contain multiple copies of the destination content and automatically switch users onto new routes to the site when others break down.

Distributed Thievery?

Cool and promising, sure, but DC is not without its dangers. Security is among the greatest concerns: A Web of grids brimming with live data, applications, and vital information services could be a hacker's dream come true. And then there is the service model itself, the idea that people will pay for computing resources incrementally as they do for gas and water. Considering that publishers and software makers such as

Microsoft still struggle to convince users to "subscribe" to Web sites and even software, does the notion of paying for computing as a "utility" really have legs?

A more troubling question for end users may be: Who decides which resources, maybe yours or your company's, are used in DC? Controversy erupted last spring when users discovered that the popular P2P file-swapping engine KaZaA was installing a DC client, Brilliant Digital's Altnet, on their systems. Ultimately, the agent can be used to create a massive shared storage resource from users' PCs that BD can resell to content companies, such as music publishers. Not all KaZaA users were pleased.

Like every technological advance that preceded it, large-scale distributed computing both within the enterprise and across the Web is a phenomenal promise wrapped in a new set of questions about security, privacy, and even control over our own PCs. 

by Steve Smith

Want to create your own DC network? See www.cpumag.com/cpudec02/dc.

Ian Foster: The Tool Man

Ian Foster is one of the core thinkers and developers of the grid computing concept, and his own life may be an exercise in distributed computing. Between the time he spends as head of the Distributed Systems Lab at Argonne National Laboratory, as a computer science professor at University of Chicago, and as one of the major developers of the open-source grid computing toolkit for the Globus Project, Mr. Foster found time to map out for us the current state of the grid.

CPU: How is the grid distinct from distributed computing?

Foster: Distributed computing is something we have been doing for decades. Grid computing has been inspired and enabled by the emergence of

very high-speed networks. It's possible to link together distributed resources in ways that were not previously possible. This new focus is on finding and putting in place persistent infrastructure that can enable these distributed resources to be used in tightly coupled fashion... a new sort of infrastructure that enables these new sorts of applications.

CPU: What kind of applications does this make possible?

Foster: There are a number of constituencies. In the science community, the interest is in enabling these large collaborative groups of scientists to share data and computing resources and scientific instruments more effectively so they can solve very large and complex problems.

In industry, there is a lot of interest in using these emerging grid service standards as a means of managing collections of Web services and delivering services over coordinated resources. Companies such as IBM, Sun, and HP are very interested in the utility computing model as a means to outsource various forms of computing, whether it is computing or storage or applications.

CPU: Why is the Globus Project important?

Foster: We got involved in this early on in 1995 and saw a lot of people out there trying to explore new modes of distributed computing in this high bandwidth era and realized there was a need for basic infrastructure that would overcome the various technical

obstacles related to authentication and authorization and resource discovery and resource access. We started building various pieces of that infrastructure and that became the Globus Toolkit, which has now been widely adopted. It's really got people united around this idea that infrastructure is needed and it needs to be based on interoperable, open standards. What we started a year ago was designing a new version of the toolkit, which will be based on the integration of the grid technologies and Web services. The core interfaces are near final in the Global Grid Forum (www.gridforum.org) and a half dozen companies have made commitments to link to them, but there aren't any products out there yet. ▲

My Account
WELCOME, MIKE ALLEN
STATUS: GOLD
MILEAGE BALANCE:
136,257

Net SAAver Alerts
FROM: CHICAGO, IL
TO: ST. THOMAS, VI
ON SALE

Baggage Claim
American Airlines
gates 23-42

Flight Status Notification
> FLIGHT 1138
DEPARTURE GATE HAS
CHANGED TO GATE C12.

Do they know something about
air travel that you don't?

> Introducing the new AA.com

Log on to the new AA.com and you'll know how to travel in a whole new way. You'll know that the My Account feature allows you to personalize information and store travel preferences to speed booking. You'll know how to manage your AAdvantage® account and receive Net SAAver Alerts to as many as 30 of your favorite cities. You'll know that Flight Status Notification delivers the latest gate and flight time updates to your cell phone, pager, PDA or e-mail. And you'll know you can use and earn AAdvantage miles online for everything from booking flights to purchasing upgrades. But there's a lot more you'll know. So add to your knowledge base by simply logging on to the new AA.com today. **American Airlines**

The new **AA.com** Now you know.

Coder's Corner: XML

Core XML

The XPath Language, Part 2

In *Coder's Corner: XML*, Ian Graham shows you how to program with XML. Ian is the author of numerous books pertaining to Web development, including *"The HTML Sourcebook"* and *"The XML Specification Guide."*

Last month's article introduced XPath, the language used in XML to reference places, or nodes, in an XML document. The article looked at the simplest form of XPath—location paths referencing sets of XML elements—and noted how such expressions look much like URLs. This similarity to URLs is intentional to help make it easier to understand basic location paths. An example of this is the location path `/a/b/c`, which references `c` elements that are children of `b` elements that are children of the document element `a`.

Don't let this similarity delude you, however. XPath expressions are quite different and more complicated than URLs. For example, a given URL references only one resource, whereas a single XPath expression can reference many different nodes. This collection of nodes is referred to as a "node set" in XPath. Remember this term, as it pops up constantly in articles on XPath and XSLT, which is a language for processing XML.

Although last month's article primarily discussed elements, XPath can reference most components of an XML document, including attributes, comments, and text. This month we look at how these other references work and more generally at some of the subtler aspects of location paths.

Attributes, Comments & PIs, Oh My!

In addition to element nodes and a document's root node, location paths can reference five other node types: comments, PIs (processing instructions), text, attributes, and namespaces. Comments, PIs, and text nodes are referenced

using XPath test functions that test for the existence of such nodes.

Test functions in XPath are indicated by parentheses after the function name, such as `comment()`. Attributes are identified by name, much like element nodes, but using a special notation that distinguishes attributes from elements. Namespace nodes are identified using a third mechanism, which we won't discuss here (because if you think things up to now have seemed complicated, things get more so adding namespaces to the mix).

The following XML document helps illustrate how these mechanisms work:

```
<?xml version="1.0" ?>
<?xml-stylesheet href="test1.xsl" type="text/xsl" ?>
<!-- first comment -->
<main>
  <?second-PI in document ?>
  <a> first text chunk inside first a
    <!-- second comment inside a -->
    second text chunk inside first a
    <!-- third comment inside a -->
    <?third-PI in document -->
    <b link="/main/a/b/@link"> b inside a </b>
    <?fourth-PI in document ?>
  </a>
</main>
<!-- last comment -->
```

Comment nodes. Comments, in the form `<!-- comment text -->`, are referenced using the `comment()` test function. For example, `/comment()` selects for comments that are children of the root node (that is, outside the document element, `main`). In the example, this path references two comments: the one in front of the `<main>` start tag and the one after the `</main>` end tag. You can use the square bracket notation to reference an explicit

Web User Testing: Part III

Ready to start user testing your Web site? In this final segment of my Web User Testing series, we'll get down to the tactical business of conducting a test, from finding people, to the types of questions to ask, to evaluating your results. By now you've developed a few testable "click-through" prototypes (see my two previous columns) and have identified the type of people you need to find who match your audience profile.

Find People To Test

Now that you know what kind of people you are looking for (men and women aged 40 to 45 who shop online), it's fairly easy to go recruiting. You do not need to find a random sampling of people from around the world. Remember, we are doing rapid, early-stage user testing that is not meant to be a financial or time barrier to the project. Ask friends and business colleagues to be test subjects.

Before you ask, however, make sure you have a story to tell. Tell people how long it will take (hopefully no more than one hour), agree on a time, tell them what you'll be testing, and what, if anything, you will offer as a thank-you gift. Remember, you need to recruit seven to 10 people in order to have more reliable testing results.

Prepare A Test

Each click-through prototype should illustrate a real-life scenario and should take about 10 to 15 minutes to test. Prepare a document that describes the scenario and the goal in one short paragraph. You will read this scenario to each user before beginning the test. For example:

Test 1: Buying Multiple Candles. In this scenario, you are coming to the home page with the intention of buying candles X, Y, and Z. You already know the names of these candles and just want to find and purchase all of them as quickly as possible.

The description will focus the user's thinking, and you can better evaluate how people navigate through the task at hand. Are people using the

search function? Are some people browsing through the catalog? Are they able to find and add multiple items to their shopping cart?

Ask The Right Questions

The most important thing in a user test is phrasing your questions correctly. Focus on high-level concepts and don't use words that are found in the interface. For example, "How would you search for candle X?" is wrong on two fronts. First, it suggests that people must use a search function to find a candle when they could use a product index or browse the catalog instead. You need to see what people will do of their own accord. Second, by saying the word "search" you set users on an unconscious mission to find the "search" box on your page. A better way to phrase the question is "You are looking for candle X, how would you go about that?"

Once people begin trying to find candle X, record their impressions and comments about what they would expect to see and what they would click. It's OK to tell people they are working with a semifunctional prototype. If they want to click a particular button that you didn't expect (one that isn't "hooked up"), make a note of their deviation and tell them how you expected they would proceed. This will begin a dialog and maybe offer new insights that could increase the site's usability.

Evaluate The Results

After testing seven to 10 people with the same methodology, you should have a fairly consistent read on what is and isn't working in your site. Review your notes with the team and decide which things were loud and clear that need immediate attention, what things were great suggestions, and what isolated comments could be dismissed. By conducting a few informal tests, you'll have a site that's far better than one that was never tested. ■

You can contact Lisa at lopuck@cpumag.com and see her work at www.lopuck.com.

The most important thing in a user test is phrasing your questions correctly. Focus on high-level concepts and do not use words that are found in the interface.

Holiday Wish List

1-5. Offer Web Power Tools Primer courses at www.lopuck.com.

6-8. Sell my watercolor paintings in Maui galleries.

9. Begin riding my recently broke Hannovarian.

10. Get a cool new convertible.

music2go.txt

Christmas is upon us once again. 'Tis the season to boost the economy by purchasing lavishly expensive gifts for those you love. And I ask you, what is more desirable than the gift of music? I decided to check out the Archos Jukebox Studio 20 MP3 player and propose that it is a fine holiday present for anyone you know who likes their music on the go.

Apple's iPod has, in many ways, revolutionized the portable MP3 market. Its tiny form factor and easy connectivity to iTunes make it highly desirable. Long battery life and an excellent user interface through its intuitive dialing dish thing make it actually usable. FireWire connectivity means that you really can drop music on and off it without it taking half your life. And with 5, 10, and 20 gig hard drives, it really can store enough music to keep you going for a long time.

Alas, I do not have a Mac. And FireWire on the PC is just not pervasive enough to make an iPod feasible. I could run a handful of Windows apps and connect to the tiny wonder, but under Linux, I'm awfully hard-pressed to get my tunes onto the iPod. And that price tag is awfully steep.

That's where the Archos Jukebox steps in. Its form factor is just a bit larger than that of the iPod, and it has a few extra ounces to show for it too. Its physical interface is somewhat clumsier: Instead of the lovely dial, it has six buttons. It's easy enough but not nearly as quick to find specific tracks, but it'll do. Battery life is reasonable: Archos claims eight hours, but I think six is a little more in keeping with my experience. The Archos Jukebox is a little large for jogging with, but frankly, I'm not sure how I feel about jogging with any hard-drive-based MP3 player. I use mine in my car and in the office and for any sort of activity that involves walking.

Here's the trick: The Archos Jukebox Studio 20 is three parts MP3 player, two parts USB hard drive. You can use it as a backup device or a way to bring files back and forth between home and the office. Installing MP3s requires no special software; you simply drag your MP3s to the device and navigate the file system to find the tracks you like. If you have the proper ID3 tags

installed on your MP3s and a reasonable organization system for your tunes, you should find this to be very easy. Copying music back and forth is reasonably speedy, as the device is USB 2.0-based. Make sure your machine supports this new spec, or else you'll fall back to the much, much slower USB 1.0 speeds.

Because the Jukebox is just a big hard drive, installation and connection to your PC is easy. Linux drivers are included with recent kernels, and Windows is just a USB Mass Storage driver away. Best of all, there's no pesky copy protection hindering your ability to copy music to and from the device (a seriously annoying shortcoming of the iPod, as a friend learned when she deleted tracks from her Mac, figuring she could restore them from her iPod later). Any playlist you have in M3U format will work with the Archos Jukebox, and the default firmware has a few standard functions, like a full shuffle of the library.

Recently the RockBox project has undertaken the sizable project of reverse engineering the Archos firmware. You can track their progress at rockbox.haxx.se. Rockbox already

has most of the functions of the original, with other helpful additions like a smarter suspend/resume function. With any luck, by the time you read this they will have playlist functionality that surpasses the default firmware. And the higher-end Archos Jukebox Recorder unit, which has a fancier screen, has font control and a variety of simple video games available.

What the Archos Jukebox lacks relative to the iPod is the raw sex appeal. The iPod is simply a stylish, classy device. It screams out cool. The Archos Jukebox has most of the same functionality but costs several hundred dollars less than a comparably sized iPod. Factor in Linux, Windows, and USB 2.0 support, and you have a more compatible device that puts a massive music jukebox in your pocket. Santa would approve. And so will that certain someone who wants to take several hundred albums with her next time she is going on a drive. ■

Sound off to Rob at malda@cpumag.com.

**The Archos
Jukebox Studio 20
is three parts MP3
player, two parts
USB hard drive.**

Holiday Wish List

1. Decked-out Apple PowerBook
2. Decked-out Apple PowerBook
3. Decked-out Apple PowerBook
4. Decked-out Apple PowerBook
5. Decked-out Apple PowerBook
6. Decked-out Apple PowerBook
7. Decked-out Apple PowerBook
8. Decked-out Apple PowerBook
9. Decked-out Apple PowerBook
10. World peace



check is useless for things words can't describe.

While we can't put into words the impact of a Nikon digital image, we can tell you a little about the camera that created this one. Introducing the Coolpix 995. It comes fully loaded with 3.34 megapixel resolution, 4x Optical Zoom-Nikkor lens, automatic exposure with manual override, a pop-up Speedlight, and a quick review feature that instantly allows you to scroll through your images. With this many options, the only limit is your imagination. Visit nikonusa.com or call 1-800-NIKON-USA.



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The Perfect Gift

Each holiday season we scurry around shopping malls, looking for some thing worth giving. But face it: In the end, all we can really give is our time. Why not turn your extensive knowledge, expensive hardware, available free time (and shortage of funds) into a gift-giving machine? This year, give the gift that goes on forever: the Internet.

Unimaginable as it may be to hardcore enthusiasts, there are potential Web surfers everywhere, eagerly awaiting their first ride in the waves. For confirmation, look no further than your Great Aunt Lili. Wouldn't she like to read the current issue of her hometown newspaper? Find that recipe for breadfruit pudding from the 1950s Betty Crocker cookbook? Locate old friends? Email her grandchildren? Find the best price (and side effects warnings) for Uncle Alfred's blood pressure medication? Sure she would; she just doesn't know it yet.

Start easy by booking a surf session where you do the driving. Make sure your gift recipients are comfy, reset your browser font to "largest" so older eyes don't have to squint, and off you go. To make it personal, I always begin by seeing if they or someone they know is already referenced somewhere online. For these kinds of obscure references, I find All the Web (www.alltheweb.com) and Teoma (www.teoma.com) search engines can offer more possibilities than the Google (www.google.com) popularity contest. If you strike out there, Google some famous crooner from their youth and watch a smile light up their eyes.

Use this opportunity to learn about their childhood, inquire about family skeletons, grasp a bit of history from people who actually lived it. The secret is to take your time and just see what pops up. If things go really well, make printouts of the best parts of the journey for them to read later (remember to print with large font if they need it). And don't forget this is a two-way street. You can let them into your world by showing them what you like about the 'Net. (But go easy on the fragging sprees and thumping bass; this is their gift, after all.)

At some point (maybe wait until your second session), encourage your ride-along surfers to try the mouse for themselves. If they are interested but hopelessly unable to grasp the concept, much less master the hand-eye coordination required, try feedback training using a task they already understand and know how to perform. Yep, Gates' gift to Grannies: Solitaire! It is truly magic. I've given up explaining how a mouse works, but even the most difficult case will improve after a few hands of Solitaire. If your OS does not come with the game installed, Microsoft and Windows Users Group Network recommend Goodsol Development's Pretty Good Solitaire, a collection of 500 solitaire card games (30-day free trial, \$24 purchase at www.goodsol.com). Be prepared by making sure you have Solitaire on hand before you start the gift session—no sense ruining the moment by making them sleep through a download/install their

first time out. Save that for later, when they are really hooked!

There are plenty of other ways to utilize your hardware obsession for holiday cheer. If you are the family geek, you probably already get hit up for search requests from the mouse-phobic in your clan. Get gift credit for those requests by issuing redeemable Search Gift Certificates! And if things look promising with Lili and Alfred, you can move on to Web mail (find addresses of friends and family for them so they have someone to write to and then make sure you pass on the messages that come in), obscure music (vintage recordings can provide an amazing memory jolt), old photo repair/retouching (make additional copies of special pix for the family archives), and even budgeting (reality check: living on a fixed income is tough!). Maybe even build them a PC of their own if they really get into it, then encourage them to volunteer at their local Senior Center helping other seniors get online. This really is the gift that goes on forever. But it starts with you. ■

**In the end, all
we can really give
is our time.**

ably already get hit up for search requests from the mouse-phobic in your clan. Get gift credit for those requests by issuing redeemable Search Gift Certificates! And if things look promising with Lili and Alfred, you can move on to Web mail (find addresses of friends and family for them so they have someone to write to and then make sure you pass on the messages that come in), obscure music (vintage recordings can provide an amazing memory jolt), old photo repair/retouching (make additional copies of special pix for the family archives), and even budgeting (reality check: living on a fixed income is tough!). Maybe even build them a PC of their own if they really get into it, then encourage them to volunteer at their local Senior Center helping other seniors get online. This really is the gift that goes on forever. But it starts with you. ■

*Send mistletoe hats and fuzzy socks to
joan@cpumag.com*

Holiday Wish List

1. New lungs (with underwater option)
2. Indelible ink for indestructible photo paper
3. Quad monitor setup
4. Cheap/sturdy 50 cycle, 240 volt in-line water heater
5. Lifetime supply of ripe guavas
6. Ocular implant (with telephoto and image capture capability)
7. Self-cleaning kitty litter
8. Floor-to-ceiling library shelves (stocked) with rolling ladder
9. Motorcycle anti-crash force field (high-speed version)
10. World peas (in iPod)

Road Warrior

Acer Gets Wise, Cell Phone Ruling, Scotte Has A New Look, USB Gets Up & Goes, & More From The Mobile Front

MobileWise Inks Acer

Companies really ought to stop creating problems for their products to solve. Case in point: MobileWise's (www.mobilewise.com) wireless electricity system solves the "Last Wire" problem. (How much of a problem can something be if the company that "solves" the problem has a trademark on the problem name?) Although we have our doubts as to



The Wire-Free Electricity Base from MobileWise can power properly equipped electronic gear laid on top of the base.

just how large the "last wire" problem truly is, we will admit that MobileWise's product is pretty cool, although perhaps not as cool as the phrase "wireless electricity" may imply.

The company's Wire-Free Electricity Base looks like a simple desktop blotter (except this blotter plugs into an electrical outlet). Any device that's fitted with a Wire-Free Electricity Adapter that's placed on top of the blotter runs as if it were plugged directly into an outlet.

According to MobileWise, the base is "as safe to use as a mouse pad." Embedded contacts in the base search out contacts on the bottom of mobile devices. When the base contacts a mobile device, it asks a controller embedded in the mobile device for power specifications. The chip checks the voltage to be sure it's correct before passing current to the system. Other base contacts continue to monitor for additional equipment but carry no voltage.

Currently, MobileWise plans to sell its technology to OEMs rather than consumers. The company announced in September that it had reached a deal with Acer, which expects to be the first major notebook manufacturer to offer MobileWise technology sometime next year.

Sony's OS 5 Goodness

Sony has been pushing the boundaries of the Palm OS when it comes to multimedia since it started producing Palm OS devices. The company was one of the first Palm OS licensees to offer a high-resolution display and one of the first to offer built-in MP3 playback capabilities. With the recent release of Palm OS 5.0 and its support for faster processors, Sony now has some extra horsepower to work with, and it's putting it to good use.

At press time, Sony was set to release its first Palm OS 5.0 device Oct. 28. The new device, dubbed the PEG-NX70V, looks very much like Sony's NR70V. Like the NR70V, the NX70V features a clamshell design with a keyboard on one side and the display on the other. The display can rotate so you can close the PDA with the screen facing out. The NX70V also includes a small camera mounted to the hinge, but unlike the NR70V, this camera can record MPEG-4 video in addition to still images. You can save video and still images to a removable MemoryStick, allowing for additional storage.

In addition to Palm OS 5.0, the NX70V will feature a 200MHz ARM processor and high-resolution color display (320 x 480). And, of course, the NX70V isn't going to come cheap. The device sells for \$599.99 online from Sony (www.sonymstyle.com).

Palm Rebrands Yet Again

You have probably noticed that Palm (www.palm.com) has again restructured its line of PDAs. The m100 line—composed of low-end, low-cost PDAs made primarily for consumers—will now be sold under the Zire brand and distributed through a wider retail channel, including department stores. The higher-end m500 series will be known by the much cooler name "Tungsten." At press time, the launch of the first Tungsten device was expected before the end of October.

The new Zire device was announced Oct. 7 and features a new, boxier shape replacing the curves of the old m100 devices. The initial product in the Zire lineup will feature 2MB of RAM, no expansion options, and just two hardware buttons.

Palm's new Zire is nothing to look at, but it has a great price.





The ScottieVest 2.5 is the latest in mobile gear, with more than 22 pockets and a system that lets you use the jacket's lining to wire devices in its various pockets.

Tech Gear

If you're like us, you have too much mobile crud to carry around, including a cell phone, PDA, MP3 player, and possibly a small notebook. That's not including standard-issue crud everyone walks around with (car keys, change, etc.). The ScottieVest 2.5 (\$139.99; www.scottievest.com) is the latest techno-jacket designed for the mobile gadget lover. We outlined version 1.0 in our maiden *CPU* issue (December 2001, page 71).

The new version features a number of improvements, including removable sleeves and an extendable key chain. The 2.5 model also boasts more than 22 pockets, including a new pocket-in-pocket design for the front two outer pockets. The design lets you keep a cell phone and PDA in the same pocket without dinging up the devices. The main attraction, however, is still the jacket's PAN (personal area network) conduits. That's fashion-technobabble for Velcro lining that conceals wires. Keep your MP3 player easily accessible in the front pocket but conceal your headphone's wire in the jacket's lining. Tiny pockets around the collar can even accommodate small earbuds when not in use.

Version 2.5 sells in black and blue. Additional variations on the standard 2.5 design include the 2.5s-Sport jacket (\$129.99) and the 2.5w-Women's (\$139.99) jacket.

Cell Phone Radiation On Trial

On Sept. 30, U.S. District Judge Catherine Blake found that tests linking cell phone radiation with an increased risk of brain cancer didn't pass the Daubert test, a basis used to determine whether scientific testimony is admissible.

Blake's decision—stemming from an \$800 million lawsuit Dr. Christopher Newman filed against Motorola claiming radiation from his analog cell phone caused his brain cancer—focused primarily on studies by Dr. Lennart Hardell and Dr. Henry Lai.

The Lai study detailed that rats exposed to 2,450MHz frequencies showed an increase in the number of DNA breaks (which may lead to mutations, including cancer). Blake noted that the 2,450MHz frequency used in the study was far above the 824 to 848MHz range of Newman's cell phone. She also found that Dr. Lai didn't put forth any opinions of causation in his study and that Lai had taken part in an unpublished study that showed no increase in rat DNA breakage at 837MHz. According to Blake, serious issues regarding the relevance of Lai's study to Newman's case prevent it from passing the Daubert test.

The Hardell study included a survey of users diagnosed with brain cancer. The study claimed to find a significant correlation between cell phone use and cancer. The study further claims that risk for cancer is greater on the side of the head a cell phone is usually held to. Once again sighting potential relevance issues and questioning the methodology of the study, Blake ruled that Hardell's study didn't pass the Daubert test.

Although no one is denying that cell phones emit radiation, there's significant debate over the risk from cell phone radiation. Because cell phone radiation doesn't ionize like X-ray radiation, it's widely believed to be harmless in doses delivered by cellular phones. SAR (Specific Absorption Rate) is the measure of exposure to RF radiation measured in watts per kilogram. According to Blake's ruling, Dr. Lai and others have stated that the vast majority of studies show no harmful effects from cell phone radiation, provided SAR levels remained below 4 watts per kilogram. Dr. Newman's cell phone had a maximum SAR level of 1.1 watts per kilogram.

Infinite Loop They Just Don't Get It

The RIAA (Recording Industry Association of America) is the organization that helped bring Napster down. Now it's trying to shut down peer-to-peer networks enabled by such software as LimeWire and KaZaA, claiming that file-sharing networks are a primary reason music industry sales have plummeted 16% in the past two years. Using complicated math, the RIAA claims consumers should be happy with current CD prices (the average retail price is supposedly \$12.75) and says if CD prices had risen at the same rate as other consumer products, they'd cost almost \$34. Seems to us that the prices of most digital products tend to go *down* over time. Anyway, a Forrester Research survey found that exposure to new music through free MP3s actually caused 39% of users to spend more on legit CDs.



BRIDGE FOR SALE: \$150



Introducing the Harman Kardon DAL 150 ezlink™. It connects your PC to your home audio system—so you can listen to your computer's MP3 files with exceptional sound quality. For even better sound, use it with a Harman Kardon receiver with onboard MP3 decoding. For more information and to locate retailers, visit www.harmankardon.com or call 1.800.422.8027.

WE'VE (FINALLY) LANDED

BETTER LATE THAN NEVER, RIGHT?

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- **The CPU Web Log.** Each weekday, our editors scour the Web to bring you the best high-tech (and occasionally offbeat) information in an entertaining way.
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- **More hands-on hardware reviews.** Are the latest products worthy of their marketing hype? We put some of the products to the test, complete with comparison charts and links pointing to where you can buy the products online. *
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The screenshot shows the homepage of ComputerPowerUser.com. At the top is the CPU logo and navigation links like Login, Register, and Shop Online. Below this are several featured sections: 'Register Here' with links for new subscribers, 'CPU Forums' with topics like 'This Month's Issue of CPU' and 'Rumor Mill', 'Latest Issues On Newsstands Now' featuring 'Computer Power User' and 'Smart Computing', 'Search All Articles' for finding specific content, 'CPU Web Log' with articles on modding and Windows DAA, and 'About Us' with contact information. A footer section includes copyright notices and a link to the Sandhill Publishing Web Site.

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Plug In, Sit Back & Fire Away

The entertainment world, at least where it pertains to technology, morphs, twists, turns, and fires so fast it's hard to keep up. But that's exactly why we love it. For the lowdown on the latest in PC entertainment, DVDs, consoles, and just stuff we love, read on.

Nintendo GameCube

Super Mario Sunshine Return Of The Plumber

Industry pundits and gamers alike were more than a little surprised when the GameCube didn't ship with a Super Mario game. Now, roughly a year after the GameCube's launch, Super Mario Sunshine has hit the streets, and we think the game is worth every bit of the wait.

SMS looks and sounds fantastic, and although lots of things in Mario's world are the same (bright colors and cartoonish characters), everything is cleaner, sharper, and bigger.

In SMS, Mario runs, jumps, and butt stomps like before, but he also gets to use an all-new accessory: the FLUDD (Flash

Mario's buddy Yoshi is back and handier than ever because he can take you places you can't go without him.

Liquidizer Ultra Dousing Device) backpack. FLUDD generates high-pressure streams of water that do all sorts of cool things depending on what nozzles you have equipped. Because FLUDD is water-powered, whenever your pack runs out of fuel, you just jump into the nearest water and fill it up again. Oh yeah, FLUDD can also talk and will give you advice from time to time on how best to proceed.

Super Mario Sunshine doesn't fall far from the tree, but it is far and away the coolest platformer to hit any game platform in quite a while. Kids and old-school gamers alike will have a blast exploring Isle Delfino



and collecting coins and Shine Sprites. This game is essential GameCube material. (For a full review, visit At Your Leisure online.)

Super Mario Sunshine (NGC)

\$49.99 (or \$189 with the GameCube)

Nintendo

www.supermariosunshine.com

Resident Evil 0

Capcom's Resident Evil series (known as Biohazard in Japan) has been the gold standard among survival-horror games since 1996 when the first RE title hit the PlayStation. This holiday season, Resident Evil 0 for Nintendo GameCube will take gamers back to just before the incident that started it all. RE0 promises to be one of the hottest GameCube titles of the year.



Resident Evil 0

\$49.99

Capcom

www.capcom.com/ResidentEvil/entry

Star Wars: The Clone Wars

LucasArts' console treatment of the epic battles fought during the Clone Wars looks to warm things up for GameCube and PlayStation 2 owners alike this holiday season. The game picks up where Episode II left off, putting players in command of Republic forces fighting to prevent the Separatists from reassembling an ancient Sith weapon.



Star Wars: The Clone Wars

\$49.99

LucasArts

www.lucasarts.com/products/starwars/theclonewars

Spyro: Enter The Dragonfly

Spyro the Dragon is back for more platforming adventures. This time, however, Spyro can breathe more than just fire. He's added ice, electricity, and bubbles to his breath arsenal. Of course, varying conditions throughout the game's 25 levels will call for different tactics, and you'll get to take advantage of several vehicles to help Spyro out.



Spyro: Enter The Dragonfly

\$49.99

Vivendi Universal

www.spyrothedragon.com

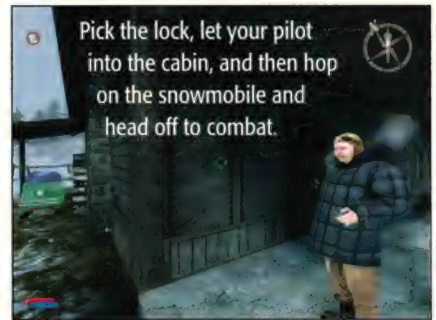
PC-CD

No One Lives Forever 2: A Spy In H.A.R.M.'s Way Bond Never Had So Much Humour

Cate Archer's second outing is a welcome addition to the FPS genre, which is saying a lot after playing Jedi Outcast and Medal Of Honor this year. Monolith did not spend its time resting on past laurels, but instead crafted an enjoyable and more streamlined storyline that wraps around the solid gameplay.

The new LithTech's engine looks spectacular, especially the water effects, and characters and environments look good (an A- to UT2003's A grade); we were more than impressed the first time we noticed eyes blinking and looking around.

NOLF2's AI is entertaining and adds replayability to the game. If you make noise, the enemy will hunt for you. You can knock out your enemies, search them, lighten their load, and then bugger off. We spared many an enemy for their comedic observations. Besides, you are rewarded with skill points for completing missions without killing anyone. You can gather skill points and distribute them to improve Cate's attributes as you play through the game. Not since the Thief games has a developer pulled off stealth so effectively. NOLF2 is a very enjoyable



first-person experience, so we recommend you get off the bog and get playing.

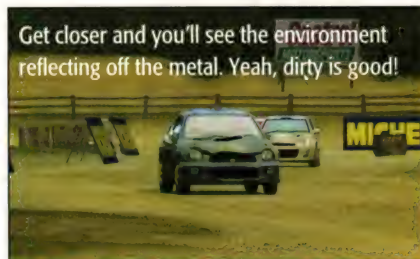
No One Lives Forever 2 (PC)

\$49.99

Vivendi Universal Publishing
nolf2.sierra.com

RalliSport Challenge Mud Slinging's Good

We spent nearly a week being unimpressed by EA's NFS Hot Pursuit 2 on the PC and Xbox, so getting behind the wheel of Microsoft's Xbox-to-PC port was a welcome relief. For those of you who haven't played the Xbox version, RalliSport Challenge is one of the best rally racing games on any console, but one look at the PC version made us forget all about the Xbox. Long live the PC. RalliSport Challenge is one of the best looking racing games to show up on the PC. Developer Digital Illusions really did its homework.



The physics are a wee bit forgiving and there's no in-car dashboard view. The body doesn't take as much damage as we'd like, but the game has plenty of arcade-style rally-racing fun to go around with faithfully reproduced sound effects. Bushes sway and cars kick up dirt, leave tracks, and spray mud. It's stunning.

You have a choice of four different types of rally, 29 vehicles, 48 tracks, and a well-developed Career Mode to keep you from throwing in your helmet anytime soon. You can also race up to three friends on your network. Fans of rally and arcade racing games should not pass up this challenge, but those with a penchant for simulations may want to hold their wads until Codemaster's Colin McRae Rally 3 ships for the PC in spring 2003.

RalliSport Challenge (PC, Xbox)

\$39.99

Microsoft
www.microsoft.com/games/PC

Age Of Mythology

From Ensemble Studios, the folks behind Age Of Empires, comes the game that any self-respecting strategy gamer is going to want this holiday. Bruce Shelley previewed the game to us during the summer months, and we've since been playing the beta. RTS fans are in for a treat of mythological proportions. AoM should be available shortly after you read this.



Age Of Mythology

\$49.99 (\$74.99 for Special Edition)

Microsoft
www.microsoft.com/games
/ageofmythology

Unreal Tournament 2003

UT2003 is tiding us over as we eagerly await more single-player-oriented FPS action in the form of Unreal II: The Awakening early next year and id Software's Doom III (when it's done). This is the game for you if you prefer your action delivered as multi-player mayhem. Gorgeous graphics, well-honed gameplay, clever level design, and more game modes are all here. Our full review follows next month.



Unreal Tournament 2003

\$49.99

Atari Games
www.unrealtournament2003.com

Mafia

Our reviews of the PC and PS2 versions of Grand Theft Auto 3 were ecstatic. Now it's time to step into the shoes of mob man Tommy Angelo as he recounts the '30s, when prohibition was in full swing. Kudos to developer Illusion Softworks for building a believable world in which you can lose yourself completely. Just be sure to keep the kids out.



Mafia

\$49.99

Gathering Of Developers
mafia.godgames.com

Sony PlayStation 2

TimeSplitters 2 Fragging Through Time

The follow-up to Eidos' 2000 PS2 hit *TimeSplitters* is a rollicking FPS that shows considerable improvements over the original. The game's development team, Free Radical, includes elements of the Rare team that graced the Nintendo 64 with its greatest FPS, *GoldenEye 007*. You'll see echoes of the Bond game in TS2, but *TimeSplitters 2* is clearly in its own league.

Like its predecessor, TS2 includes a heavy emphasis on multiplayer action, offering up scads of deathmatch and cooperative play options. But unlike the first game, this



one provides a strong single-player game, an addition we appreciate. TS2's Story mode pits you against aliens who travel through time to mess with history.

To combat this temporal chicanery, you'll play through 10 levels that represent different eras spanning 500 years (from 1853 to 2401). In each level, your character

TimeSplitters 2's time-travel motif means you'll get to mix it up with all sorts of baddies, from '30s mobsters, like these guys, to futuristic robots.

will become someone from the era at hand, and you'll have to use the weapons of the time to get the job done. The resulting variety of weapons, enemies, and environments keeps TS2 fresh and exciting from level to level. The game's graphics, sound, and control are all first-rate; we recommend this one without reservation.

TimeSplitters 2 (PS2, Xbox, NGC)

\$49.99

Eidos

www.eidosinteractive.com

PREVIEW: Grand Theft Auto: Vice City The Sopranos Meets Miami Vice



Live to ride, Tommy.

In a nutshell, *Grand Theft Auto: Vice City* (Rockstar's follow-up to 2001's smash PS2 hit *GTAAIII*) has everything its predecessor had and a whole lot more. For starters, the game has a fresh new storyline

involving mafia hit man Tommy Vercetti, who has just finished a 15-year stretch in Liberty City's big house. Now Tommy's looking to get back into the action, and his old boss is a little nervous at the prospect (rumors exist of a possible setup). The family sends Tommy to Vice City, a sprawling urban jungle reminiscent of circa 1980s Miami, to drum up some business for the family, but things aren't always what they seem to be, and he finds himself struggling to keep his friends and enemies straight.

Voiced by "Goodfellas" star Ray Liotta, Tommy sets out to take control of the city.

Along the way, you'll drive more vehicles than in *GTAAIII* (including motorcycles and helicopters), use more moves, and have more places to go (Vice City is much larger than Liberty City and includes scads of indoor environments, as well).

Like *GTAAIII*, *Vice City* is jam-packed with nonlinear game play, exploration, and of course a killer soundtrack. The other thing *Vice City* has in common with *GTAAIII*? Most likely, it'll be the hottest PS2 game of the year. Stay tuned for a full review next issue.

Grand Theft Auto: Vice City (PS2)

\$49.99

Rockstar Games

www.rockstargames.com/vicecity

Red Faction II

In this sequel to the first great FPS game for the PS2, you're a super soldier named Alias, fighting to overthrow the corrupt government of the Commonwealth. RFI features the same fast-paced action that made the original a blast, plus a slew of new weapons, enhanced Geo-Mod technology (which lets you redefine your environment by blasting holes in your surroundings), and juiced-up graphics.



Red Faction II

\$49.99

THQ

www.thq.com

Shinobi

The latest game to bear the Shinobi name has a new look and a new ninja. Instead of calling once more on Joe Musashi, the latest Shinobi incarnation introduces an all-new character named Hotsuma. And, of course, this game is fully 3D, so there are a number of other differences, as well, but the ninja fightin', shuriken throwin' action is still non-stop.



Shinobi

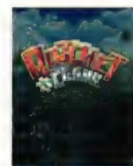
\$49.99

Sega

www.sega.com

Ratchet & Clank

Sony's upcoming platformer pairs a couple of saucy characters in a fight against evil and is a flat-out blast to play. We spent hours just playing the demo, so we can't wait to play the final game. Ratchet is an impulsive critter with impressive mechanical skills, and Clank is his practical robot sidekick with a conscience (a result of a manufacturing glitch). Together they take on the aptly named Big Bad Boss.



Ratchet & Clank

Price N/A

Sony

www.ratchetandclankgadgets.com

Microsoft Xbox

Sega GT 2002 GT3-Style Sim Driving Comes To Xbox

Sega has been a rock-solid content provider for Xbox, and Sega GT 2002 nicely fits the Xbox driving sim niche (the way that Gran Turismo 3 did for PS2). The game features several modes. The Chronicle mode is a nice touch; you can race "classic" cars from the '70s and '80s against cars from more current eras. However, the heart of the game is the Sega GT2002 Mode, which is the career mode. You start with \$13,000 in your pocket and no car. Your goal is to minimize damage to your car, win races, and make money to buy and customize nicer cars. It's a simple concept but devilishly challenging to do

well. The entire budgeting aspect adds a whole new level to the game.

Damage models are nonexistent, and your cars will get not one scratch. There's a red bar on the top-right of the HUD that drops as you take damage. The more damage you incur, the more prize money you give up to repairs. Finish a race without damage and there's a bonus for you. We just wish the cars featured damage models a la Project Gotham Racing. Microsoft must know that GT 2002 is something special; after all, it's being bundled along with Jet Set Radio Future in Xboxes this winter. So, if you don't



Sega GT 2002 features very attractive vehicular graphics, but unfortunately the game doesn't physically model damage. Grr.

already have an Xbox, this might be a good time to check one out.

Sega GT 2002 (Xbox)

\$49.99

Sega

www.wow-ent.co.jp/eng/products/segaGT2002



Hitman 2: Silent Assassin Thinking Man's Action

When Hitman: Codename 47 was released on the PC in 2000, the promising concept was plagued with control problems. IO Interactive took the criticism to heart and fixed the problems.

The game starts with the genetically engineered 47 as a gardener in a Sicilian monastery—a far cry from his days as a

deadly assassin. His days as a contract killer are over, and penance is all he seeks. 47's peaceful lifestyle comes to an end when the local priest is kidnapped. Now it's back to the old ways to save the life of someone he respects and cares for.

The game rewards you for stealth, but you can run in guns blazing if you feel the situation calls for it, though at higher difficulty levels stealth is very necessary. Often times you'll be called upon to disguise yourself in order to infiltrate the

target's location and you'll start to notice that you have many ways to complete missions. And although the graphics are nothing to sneeze at, it's the music (by the Budapest Symphony Orchestra) that sometimes chills you to the bone. Hitman 2 is definitely the thinking man's shooter and as such, it's both difficult and rewarding. We have no problem recommending this third person (with FPS options) actioner on all platforms.

Hitman 2: Silent Assassin (Xbox, PC, PS2)

\$49.99

Eidos Interactive

www.hitman2.com

Steel Battalion

Capcom's Steel Battalion puts you in control of mech-style VTs (Vertical Tanks) in 2080. Oh, and the controller that bundles with the game is a 40-button game controller that has three foot-pedals to fully immerse you in the futuristic game world. Whoah.



Steel Battalion

\$199.99

Capcom

www.capcom.com/SB

Tom Clancy's Splinter Cell

Splinter Cell was built to take advantage of the Xbox and PC from the ground up with numerous features unbeknownst to Metal Gear Solid's Solid Snake. Winter will be the time for you to take on the role of the NSA's Sam Fisher and get down and dirty in this covert third-person actioner. MGS2, watch your six. Sam Fisher has no interest in being second best to Konami's Metal Gear Solid 2: Substance.



Tom Clancy's Splinter Cell (Xbox, PC)

\$49.99

Ubi Soft Entertainment

www.splintercell.com

Unreal Championship

With Xbox Live just around the corner (we'll take a good look at Xbox Live next month) and Halo 2 not due for another year, what's going to be the online killer app for Microsoft's mean green machine? It could very well be Unreal Championship. No engrossing storyline here; it's all about putting the smack down on friends and enemies broadband-style.



Unreal Championship

\$49.99

Atari Games

www.unrealchampionship.com

Logitech MX 700 Cordless Optical Mouse

Cordless & Very Gameworthy

Cordless mice can negatively affect one's health in online bouts of UT2003 where every millisecond counts. And that's where Logitech's fantastic eight-button MX 700 comes in. The mouse features an 800dpi sensor and bundles with a charger base that doubles as the RF receiver (bye-bye infrared). We were dubious, but it works just as advertised, and gamers can say goodbye to cordless lag times.

The MX 700 is perfect for daily use and awesome for gaming. The buttons worked without installing the Mouseware drivers, and the rodent looks dead sexy. Computer power users would do well to check this baby out. Watch for our in-depth review next month.



Check These Out On The Web

See our reviews of Sierra's **LotR: Fellowship of The Ring** (Xbox, PC, PS2), Interplay's **Run Like Hell** (PS2), Sega's **Gungrave** (PS2) at www.cpumag.com/cpudec02/gamereviews.



Logitech MX 700 Cordless Optical Mouse (PC, Mac)

\$79.95

Logitech

www.logitech.com

DVD Byte by Todd Doogan

'T is the season and all that—but we're not talking about the holiday season. Not by a long shot. We're talking DVD special edition season. If you're a fan of big movies on even bigger DVDs, then get ready because three of the biggest DVD releases of the year are all coming out in time for the holidays. "Star Wars:

your gift giving (and receiving) pleasure. But are they any good? You betcha. DVD fans are in for a treat this year.



"Star Wars: Episode II"

looks gorgeous on DVD. Being the first full-length live action film shot entirely digitally, you'd have to expect the best-looking transfer on any DVD to date, and you'd get just that. Not only that, but Lucasfilm presents a nice overall package as well. Two discs devoted to the making of the film, with

commentary by the filmmakers, featurettes, and assorted other goodies all worth checking out.

"Spider-Man" is also a two-disc set, complete with a beautiful transfer with gorgeous color and detail, thrilling sound, two commentary tracks, and an entire DVD devoted to both the film and the comic book that spawned it. This film was a long time coming, and this DVD only makes the wait that much more worth it.

Finally, the big boy of the bunch, "Lord Of The Rings: Fellowship Of The Ring" returns to DVD as a huge four-disc box set with an all-new cut of the film adding a whopping 30 minutes to the film and adding layers of excised material back into the film. Not only that, but four commentary tracks and two whole discs bring to light just about everything you could ever hope to know about the making of this

film. Add a heart-stopping DTS 6.1 EX soundtrack (along with a Dolby Digital 5.1) and you're talking one of the all-time best DVD sets ever.



All of these are must-own discs and worthy gifts for friends and family. Visit www.cpumag.com/cpudec02/gamereviews for more detailed reviews of these stellar discs. ▲



Episode II: Attack of the Clones," "Lord Of The Rings: 4-Disc Collection" and "Spider-Man" are here and ready for

Hot Shots: The Beauty Of The Game

Yeah, we know it's all about the gameplay. Sure, there are those who would have you believe graphics are relatively unimportant in the greater scope of things, but if you read *CPU* mag, you probably already know those folks are off their collective rockers. We want great gameplay combined with stunning graphics, and here are two upcoming games that show promise. Watch for them.



Freelancer (PC). Developed for Microsoft by Digital Anvil, Freelancer was originally shown at E3 in 1999 with a 2001 release date. The game should finally be seeing store shelves in the first half of 2003. Here are some current screenshots to show you progress is alive and well. We're hoping that Freelancer will be the spiritual successor to Firebird's 1980 classic: *Elite*.



Star Trek Elite Force II (PC). Unlike the original game, EFII will transition from Voyager to ST: TNG. The game is slated for release by Activision early next year. For more details, visit www.ritual.com/EF2.

Infinite Loop What's The Harm?

Beg, plead, cry, and threaten all you want; certain family members and AOL-using friends still will insist on sending you all manner of email hoaxes and chain letters. "What's the harm?" they may ask.

Assuming that half the people who receive these wastes of bytes forward them to 10 other people, a small 3.5KB email message can quickly grow into a monster. After nine rounds of forwarding, the original message will consume more than 2.7GB of bandwidth and annoy more than 781,000 people. After being passed around six more times under the same conditions, the email message will clog more than 12 billion email boxes and consume more than 42.7TB of bandwidth. Remember, if it's taking too long to load CPUmag.com, it's your Uncle Buck's fault, not ours.



SOFTWARE TIPS & TRICKS

Make The Registry Your Own

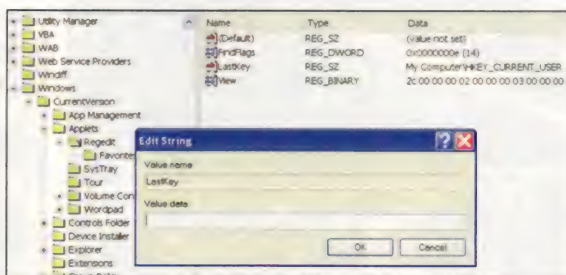
A FOOL AND HIS WINDOWS REGISTRY ARE SOON PARTED, SO BACK IT UP, BUSTER. THAT'S RIGHT. THIS IS A TIPS ARTICLE ON EDITING THE

Registry, and as is customary (and, we believe, required by law in some states), we begin by covering both your and our butts. Before venturing into the countless branches of your Registry, use the usual backup routines. For the record, in Win98 or WinMe, typing **scanregw** in the Run dialog box will update the daily backup this utility already makes of the Registry, and typing **scanregw/restore** will let you restore one of the previous five days of backups.

Both WinMe and WinXP have the System Restore utility (Start menu, All Programs, Accessories, System Tools). Create a new restore point, which will include a backup of the current Registry. Do it now; we'll wait. . .

OK, then. In this first of our two-part Registry series, let's learn to be safer and more effective in the Registry Editor itself and cover some pointers for keeping others out of your Registry.

You can access all consumer versions of the Windows Registry Editor (98SE, Me, and XP) by typing **regedit** in the Run dialog box. There is no *single* Registry file. In fact, the Registry is made up of several data files located in different subdirectories, all according to which version of Windows you are using. Regedit actually aggregates these files for editing purposes. It is important to keep in mind that Regedit works live and in real-time. Unlike any other program, Regedit does



This LastKey Value is how the Registry Editor tracks how you exit the program. In WinXP, you can juggle this Value and the Permissions function to ensure that the Editor always opens with the left pane outline fully collapsed.

not wait to save changes later to disk, so you cannot back your way out of a botched Regedit session by exiting without saving.

Regedit Etiquette

The dense Registry tree of hives and keys unfurls into a cumbersome morass quickly, so use the Left arrow key while working in the left pane of the Editor to send the cursor up to your current key's parent. A second press of the Left arrow key collapses most of the open keys that are now beneath the cursor. Repeated presses will bring you back up to the top hives and collapse the outline entirely.

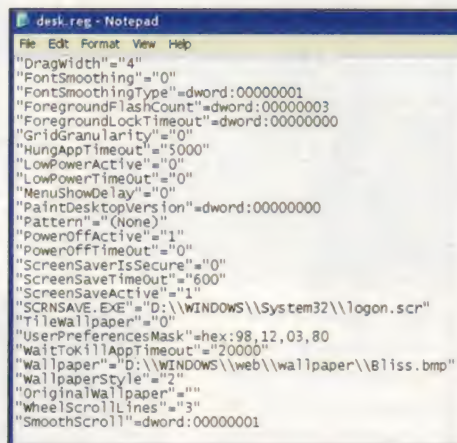
At launch, Regedit always opens to the same key that you last highlighted and with the same mess of open branches. This is because Regedit keeps track of the last key you referenced in (you guessed it) its own area of the Registry

itself. To open the editor every time with the entire tree collapsed, try this tip, which works only in Windows XP or Windows 2000 (using the Regedt32 version of the editor) because it requires that you set Permissions. Go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENT-VERSION\APPLETS\REGEDIT.

Double-click LastKey and delete the text in the Value Data box. With the Regedit key highlighted, choose Permissions from the Edit menu and put a check mark in the Deny column next to Full Control and Read. This will prevent Regedit from changing the LastKey value so that the editor always opens at the top level and with the key tree collapsed.

In Windows 98SE or Me, you can start Regedit with a collapsed tree structure only by highlighting the My Computer level before leaving the previous editing session.

This will leave the LastKey value set to the top of the key tree. If starting with a collapsed tree structure gets in the way of your tweaking, another way to navigate your usual haunts in the Editor is to use



A typical patch file uses a basic text format and simple command prompts that tell the Registry Editor how and where to import the keys and values.

the Favorites menu to bookmark any keys to which you want to return frequently.

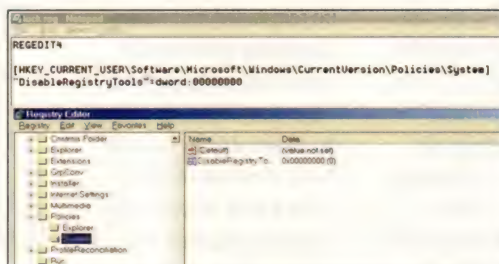
Use The Patch . . . Twice

The safest way to edit the Registry is not to do your editing in the Registry Editor itself. The patch method lets you export whatever key you want to alter and then import it back into the Registry. In order to protect yourself from misbegotten tweaks, use the double patch method: export two copies of the same key so that you have an original, unaltered version to import and correct any mistakes you might make in the edited version. Highlight the key you will be changing. (It's best to do all of this at the lowest level of the key tree you can.) Right-click the key and choose Export from the pop-up menu. Save the key with a file name that cues you to the key's function but also tags the file as your backup: *filenameorig*, for instance. Export a second copy of the key and save it as something like *filenameest*, which will be the version you work with.

These exported keys are called patches because Regedit automatically assigns them the .REG extension and associates them with the Regedit program. In fact, double-clicking a file with a .REG extension automatically imports the file to the Registry and modifies that key with the contents of the file. This is a very handy, but potentially dangerous, way to swap Registry tweaks with others or for a system administrator to make the same tweaks easily among many machines without having to manually edit each Registry.

Registry patches are simple text files. Use Notepad to view and edit them. When you open a patch in Notepad, you will see that each one begins with a line identifying which version of Windows Registry Editor you're using and then lists the precise key name that you exported. As you will see, Regedit exports the hive (top-level key) you have highlighted and all of its keys, and it doesn't necessarily organize either the keys or the value names in the same order as they appear in Regedit. This is why you want to export at the lowest key level you need.

It is important to understand that Regedit imports these patches by appending their contents to the Registry, not by replacing the current key fully with the contents of the patch. This means that when importing a patch, Regedit acknowledges and modifies any changes you make within the brackets and quotation marks surrounding



Adding a new key and the `DisableRegistryTools` Value to the Registry will lock users out of the Registry Editor. Make sure you have a patch that restores Regedit, however, as this approach will block anyone, even you, from calling up Regedit.

the keys, value names, and values in the patch files. And Regedit will add new keys and value names if they, too, use the correct bracket and quotation mark prompts. On the other hand, simply deleting a key or a value name from a patch file will not eliminate the corresponding listings from the Registry. This requires a specific nomenclature within the patch file. To delete a branch from the hive as well as all of its keys entirely, put a hyphen (-) after the opening bracket and before the hive name. For example: [-HKEY_CURRENT_USER\SOFTWARE will eliminate that key and any subordinate keys and values, so be very careful in using this command.

To eliminate a value within a key, keep the value name intact but replace everything after the equal sign (=) with a hyphen. Thus, to have your patch eliminate from the Registry a value such as

"LimitBitrate"=dword:00000001

change it to

"LimitBitrate"=-

The good thing about editing the Registry via this double patch method is that you can keep the Registry Editor open to the relevant key and see the patch take effect on the fly. You can import your patch file to the Registry by using the Import command in the Regedit File

menu or simply double-clicking the REG file you made. Windows will prompt you before applying the patch. If things go awry or look wrong, you can double-click the backup patch with the original settings to restore everything to its pristine state.

Keep The Mice From Playing

Unfortunately for administrators, there is no switch within Windows to keep users from accessing Regedit entirely. There are, however, some strategies for limiting access to the Registry or at least making it harder for novices to access it. For instance, in WinXP, Regedit lets you set Permissions for specific keys, allowing specific users on a system full editing access or simply read-only access. A Permission set on a hive applies also to its keys, so you can effectively lock down the Registry Editor by applying read-only permission to the entire HKEY_CURRENT_USER hive, for instance. Simply highlight the hive, right-click, and choose Permissions. Here you can highlight the user you want to restrict and place a check mark in the Deny column for the Full Control setting.

Another way of discouraging casual users from accessing the Registry Editor is

Registry Tweak

Make Registries Resplendent

You can organize the various Registry files in many different ways, and there are several third-party editors that make these listings easier to manage than Windows' own Regedit. Our current favorite is the appropriately named Resplendent Registrar (www.resplendence.com). What we love about the full version of this shareware program (\$44.95) is that it actually annotates the Registry. Each major hive and many of the significant keys and values have notes that explain their functionality. For Registry explorers on the hunt for new tweaks, this is resplendently indispensable. ▲

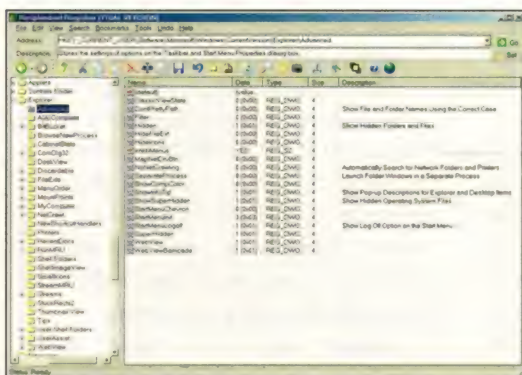
WinXP Tip Of The Month

Optimize Your Service Pack 1 Installation

Most XP users will want to upgrade to the first official Service Pack for the OS (www.microsoft.com/windowsxp/pro/downloads/servicepacks/sp1/default.asp) because it fixes a ton of bugs and security holes and even lets you uninstall Internet Explorer and Instant Messaging. But

before updating to SP1, have on hand all of your audio and video peripheral drivers, including the VIA 4-in-1 drivers for your IDE drives and AGP bus. Some users report degraded performance under SP1 because it doesn't reinstall some of these drivers or replaces them with generic

ones. Microsoft's Knowledge Base confirms that IDE drivers may need to be reinstalled, but others report that performance came back up to par only when they reinstalled all of the major drivers, as well. See our review of this Service Pack at www.cpublog.com/cpudec02/sp1. ▲



Third-party Registry editors, such as Resplendent Registrar, can reorganize the Registry entries and annotate their functionality for easier tweaking.

to remove the Run command from the Start menu. Go to HKEY_CURRENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\POLICIES\EXPLORER and, in the right pane, right-click to add a new DWORD value named NoRun with a value of 1. Then reboot your PC.

This next Registry Editor lockdown method is our favorite. In Win98/Me, we recommend creating two patches: one to enable and one to disable the switch, because once it is in force, even you won't be able to access Regedit. Use Notepad to make the first patch file. It should look like this:

```
REGEDIT4
```

```
[HKEY_CURRENT_USER\Software\Microsoft\Windows\CurrentVersion\Policies\System]
```

```
"DisableRegistryTools"=dword:00000001
```

When making patch files, always press ENTER at the end of the last entry to ensure the Registry Editor recognizes this last line of the imported patch. Once you have created the file, save it in the C:\WINDOWS directory with a .REG extension. Then double-click the file name you just created and click yes when asked if you want to add the information to the Registry. This patch creates a new key in the HKEY_CUR-

RENT_USER\SOFTWARE\MICROSOFT\WINDOWS\CURRENTVERSION\POLICIES hive and adds a DWORD value of "DisableRegistryTools" with a value of "00000001". This makes Regedit inaccessible altogether. In order to restore Regedit access, you will need a second version of the same patch as above but with the value "00000000." In WinXP, even the restore patch will not work on the Registry after you make the initial patch, but you can access the Registry with third-party editors to return things to normal.

Hey, It's Not My Default

OK, so you've played around so much with settings under a particular key that your Desktop icons are now 400 pixels wide and there's nothing left on your Start menu. It happens. But how do you

get back to those original settings (which somehow don't look so bad to you now) without restoring an earlier version of the entire Registry? Try going to HKEY_USERS\DEFAULT. You'll notice that most of the keys here match those under HKEY_CURRENT_USER. Whenever a new user logs onto the PC, Windows loads these values as the default settings for most of the look and feel aspects of Windows. After messing up a tweak to one of the keys in HKEY_CURRENT_USER, you can use the values of the keys in the HKEY_USERS\DEFAULT hive as a reference for restoring default values.

In most cases, any Registry tweak you can make within the HKEY_CURRENT_USER hive you can make in HKEY_USERS\DEFAULT, but the change will be universal and serve as the new default setting for any new users logging on to the system. 

by Steve Smith

Infinite Loop

One Of These Things Is Not Like The Other

Take a guess: Which of the following were not recently announced biomedical endeavors?

- Using cow's milk to make organic wine.
- Growing pig's teeth in rats.
- Altering genes to create pear-shaped tomatoes.
- Using goat's hooves to reconstruct ligaments.
- Making artificial muscles from shellfish.
- Genetically engineering sheep with large fat-free buttocks.

Surprise, surprise: a, b, c, e, and f are all true.

Source: Nature Publishing Group





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WARM UP TO PENGUINS

Start & Stop Programs Automatically, Part II

IN NOVEMBER'S ISSUE OF *COMPUTER POWER USER*, WE PRESENTED TIPS FOR HANDLING NETWORK TRAFFIC. THIS MONTH, AND IN MONTHS TO COME, WE DELVE INTO MORE

Linux issues and projects. This month, we focus on starting and stopping programs automatically.

Last month we began looking into rc files, or the Linux mechanism for controlling the system processes that start at boot time. We also touched on the runlevel mechanism and the final initialization file in six different Linux distributions. In addition, we looked within a specific runlevel process directory to see you'll typically find there. This month we continue with this process by learning how to actually make use of the runlevel directories, how to handle rc.local, and more.

Examine The /etc/rc.d/rc#.d Files

As mentioned last month, the rc#.d directories contain a collection of files with names that begin with K and S. For example, if you type `less K15httpd` at the command line, you'll note that the first line is: `#!/bin/bash`

If you've done shell scripting—which is a method of placing commands into a file so they can be run in sequence, somewhat like a batch file in MS-DOS—in Linux, you know the first line of a script file must tell Linux what program to use to run the file's contents.

The `#!/` portion clues the system in to the fact that this is a script file and that the container program that runs the script is about to be named and that `/bin/bash` is the default user shell (or more simply, a working environment) in

the Linux operating system. So, if you're working on the command line, you're in a bash shell, or if you're working in the GUI, it's running on top of a bash shell, and you can also run scripts that have their own bash shell containers.

Everything else in this file is either a comment (if the line begins with a hash [#]) or an instruction. We don't have the space here to fully cover shell scripting. However, to find what commands this control script understands, scroll down to the function definitions that actually handle your commands. In the case of `httpd`, look for code that matches what's shown in Figure 1, which accompanies this article.

Each of the function definitions begins with a line in a particular pattern. In our example, the functions begin with:

```
start() {
stop() {
reload() {
```

These lines tell us something very useful in regard to the commands we can use with this init script (more on this shortly).

The Master Control Directory

Calling this directory the "Master Control Directory" is a bit ominous (and actually, we made the name up), but it gets across how important this directory is. In last month's article, we talked about when we look at the contents of a rc#.d directory by typing `ls -l` at the command line, we'll see a list of files, such as:

```
lrwxrwxrwx 1 root root 19
Aug 19 16:43 K05saslauthd ->
../init.d/saslauthd
lrwxrwxrwx 1 root root 15
Aug 19 16:43 K15httpd ->
../init.d/httpd
```

As mentioned in that article, when you see the permission set `lrwxrwxrwx`, you're looking at a link, which in this case is somewhat like a shortcut. The filenames in this directory are `K05saslauthd` and `K15httpd`, but these are just shortcuts to the real files, which are specified on the other side of the arrow.

To find the real files, type `pwd` to find your current location in the file system, and then go to the directory specified. In this case, we can look at `../init.d/saslauthd` and know that `saslauthd` is the filename and `../init.d` is the directory. This is a relative directory, as the `../` means "back up to the previous directory first." So, you would type `../init.d` to enter the master directory. In our case we're working under Red Hat Linux, so the master control directory would be `/etc/rc.d/init.d`.

Typing `ls -l` at the command line in this directory gives us a different-looking output from the rc#.d directories. Here's a look at the first lines of one of our rc#.d directories:

```
total 240
drwxr-xr-x 2 root root 4096 Sep
17 07:04 .
drwxr-xr-x 10 root root 4096 Sep
17 06:34 ..
-rwxr-xr-x 1 root root 2633 Aug
23 05:37 aep1000
-rwxr-xr-x 1 root root 941 Aug
28 03:33 anacron
-rwxr-xr-x 1 root root 1458 Jun
23 06:50 apmd
```

These aren't the actual programs. For example, you might see `httpd` in here, but it's not the Web server. Instead, these are



the “control scripts” for the programs, meaning that they are short sets of instructions that let you interact with the servers without having to work directly with the server program—a kind of friendly front end interface. What you’ll see when you look in these scripts is the same thing you saw when you looked into the link within the `rc#.d` directory, so the same instructions presented in the “Examine The `/etc/rc.d/rc#.d` Files” section apply.

Make Your Own Control Script: The Basics

Having shell scripting skills is key to a complex control script, but often you don’t need something that complicated. Because there isn’t enough space in a single article (or even a series of articles) to get into all of the subtleties of shell scripting, check out the Advanced Bash-Scripting Guide at www.tldp.org/LDP/abs/html for more assistance. There are also many books on shell scripting worth checking into.

The default shell in Linux is bash. Because all scripts begin with telling the system what shell or wrapper program to use, start your control script with the text: `#!/bin/bash`

From here, your best bet is to go through the process of what you must do by hand and type in all the commands needed after this first line. A control script can be as short as a single command, such as the following line to start a mythical NetMonitor program:

```
/usr/local/bin/netmonitor
```

Be sure to check the man page (for example, you would type `man netmonitor`) for the program and see if there are any flags you want to use. If we wanted to run NetMonitor with no flags, our script would look like this:

```
#!/bin/bash
/usr/local/bin/netmonitor
```

Once we save this script in the control script directory, we need to add references to it in the appropriate runlevel directories. If you’re meticulous, you’ll want to add a reference to every single directory. We’ll go this route. First, choose the filenames.

Setting the appropriate names is easier than it looks. A control script link name in a runlevel directory starts with an S if you want to start the service when entering this runlevel, or a K if you want to stop (or kill) this service when entering the runlevel.

You’ll want to use K in the runlevels corresponding to shutdown, reboot, and anything that’s a “single user” or no networking security runlevel. In a distro such

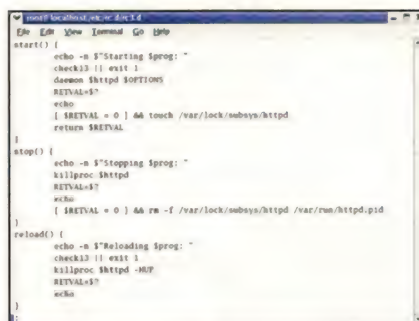


Figure 1: Here you see the routines we’re looking for within the sample `rc#.d` file. The lines beginning with `name() {` are all function definitions that set up what the script will do if you type the script’s name followed by the command (for example, `/etc/rc.d/init.d/httpd restart`).

as Red Hat and those that follow the same pattern, you’ll want to start the name with a K in the runlevels 0, 1, 2, and 6. The S is for runlevels where you’ll want this service to run. In Red Hat or another distribution that uses the same designations, the runlevels for these will be 3 and 5.

Next we have to choose the number. Remember that the example file we used was named `K15httpd`. The number determines when the process will start; the lower the number, the sooner it’s started. You must start some processes before others, so check your program’s documentation to see where it needs to lie. If you’re not sure, at the very least add it later in the cycle.

No other program will rely on our NetMonitor tool. Because we can’t choose an existing number, we’ll look through the directories and see that 91 isn’t taken. Therefore, our filenames will be `K91netmonitor` and `S91netmonitor`. Now we just need to create the links. To do so, we’ll need the `ln` command (see

`man ln` from the command line for more information about this tool).

The sequence of what we type to produce the necessary output might be:

```
ln -s /etc/rc.d/init.d/netmonitor
    /etc/rc.d/rc0.d/K91netmonitor
ln -s /etc/rc.d/init.d/netmonitor
    /etc/rc.d/rc1.d/K91netmonitor
ln -s /etc/rc.d/init.d/netmonitor
    /etc/rc.d/rc2.d/K91netmonitor
ln -s /etc/rc.d/init.d/netmonitor
    /etc/rc.d/rc3.d/S91netmonitor
ln -s /etc/rc.d/init.d/netmonitor
    /etc/rc.d/rc5.d/S91netmonitor
ln -s /etc/rc.d/init.d/netmonitor
    /etc/rc.d/rc6.d/K91netmonitor
```

Notice that runlevel 4 is missing. In distributions that follow the Red Hat sequence of runlevels, 4 is never used, for historical reasons. Now you’re set. To test your setup, you’ll need to reboot and make sure that things stop and start properly.

Not everything your system needs to do at boot time will run the entire time the machine is up. You’ll take care of these items in the `rc.local` file, which we discussed last month. At the end of this file, just add anything you need to run when the system boots. For the most part, what you add here will be in the same format you’d do it on the command line. (See the Advanced Bash-Scripting Guide mentioned earlier for doing things on a fancier level.)

Wrapping Up

The information in this article is just one more way to customize your Linux system. You can also use this information to determine what programs are starting when your system boots and delete the links for those that you don’t want running. For example, if you don’t need a Web server on this machine, you certainly don’t want one running if you didn’t ask for it. So, you could delete the `S15httpds` you find or change them to `Ks`.

Only add and delete links, not the main control scripts. Doing so lets you manage the latest versions of the scripts in one place and use shortcuts for the rest. ☺

by Dee-Ann LeBlanc

KILLER HARDWARE TIPS

Too Cool For Rules

IF YOU'RE A USER WHO CAN'T LEAVE THINGS ALONE IF THERE'S A CHANCE YOU CAN MAKE THEM BETTER, EVEN IF IT MEANS BUCKING THE NORM, READ ON. WE HAVE SOME TIPS

and tricks that just might make you more productive.

There are myriad ways to interact with your computer, including via a keyboard, mouse, touch screen, joystick, or graphics tablet. Creative hackers go beyond these pedestrian input devices, however, to control their hardware in new ways. This month we take a look at a few unusual PC controls.

As Snug As A Glove

If you grew up in the '80s or have ever rummaged through the closet of someone who did, you're familiar with the Nintendo Entertainment System, the hugely popular game system that brought Mario to home televisions. You may not be as familiar with the PowerGlove, an NES add-on.

Released in 1989, PowerGlove was a virtual reality glove you could use to control games. The glove tracked the motion of your hand in 3D space using ultrasonic sensors and tracked finger positions (whether they were straight or bent) using strain gauges. Buttons near the wrist provided additional controls. (Only one game, a boxing title, was released specifically for PowerGlove.)

With a bit of hacking, however, you can modify a PowerGlove to work with your PC. Imagine gesticulating wildly as you use it to roam the 3D environs of a FPS or reach to move a virtual chess piece.

Check out this PowerGlove Web page at www.angelfire.com/ca7/mellott124/powerglove.htm. You'll find schematics for



Hacking a PowerGlove can be thirsty work.

(Image courtesy of www.devimage.com)

connecting the device to a PC's parallel port and a text version of the PowerGlove manual. Another parallel circuit diagram is available at www.xensei.com/users/ktakki/glove/pcglove.html. A serial interface version is available at www.realitydiluted.com/projects/vrstuff. An old (and largely obsolete) PowerGlove FAQ (www.spies.com/~jet/Projects/VR/faq-0.3.html) provides information about the glove's history.

Because it hasn't been sold in a decade, finding a PowerGlove might be trickier than actually hooking it up. Units are often for sale on eBay for about \$10 to \$30. If you're persistent or lucky, you might find one at a local thrift store for less.

You'll also need software that's compatible with the PowerGlove—another treasure hunt unless you're willing to write your own. REND386, a free 3D rendering package, is one old but popular program that works with PowerGlove (<http://www.ece.uwaterloo.ca/~broehl/rend386.html>). Code

for using the PowerGlove with Linux is available from Reality Diluted (www.realitydiluted.com).

Although the PowerGlove was probably an idea that was ahead of its time, you can opt for a modern version. Essential Reality's P5 glove (www.essentialreality.com) builds on PowerGlove's technology, featuring an optical tracking system that has six degrees of freedom and five independent finger measurements. It connects to a PC via a USB connection. Versions for PlayStation 2 and Xbox will be released next year for about an expected \$150.

"The P5 glove is particularly well-suited for gamers because the majority of today's video games have a 3D user interface," the company states. The glove only works with games developed or modified to use it. Hitman 2: Silent Assassin, Tiger Hunt, and Beachhead 2002 are the first P5-enabled games. In addition, Essential Reality will release patches that add glove support to other games, such as Black and White.



If you wiggle your fingers, your computer will know with the P5 glove.



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Cheers



PowerMate is a knob you can use to control your computer's volume and mouse scrolling, plus play a mean game of Tempest.

Fly The Friendly Skies

Flight simulators are fun, but a keyboard and mouse are the polar opposite of a real airplane's interface. To make the experience more realistic, many flight-sim enthusiasts hook yoke and rudder pedal peripherals to their PCs. Flight Sim Central (www.flight-simcentral.com) offers a good selection.

Although this is a good start, true aviation junkies will want to check out the GF-AC Cockpit Control System from GoFlight (www.goflightinc.com). This PC control system offers knobs, toggle switches, levers, and displays like those found in real aircraft. You can manage your virtual aircraft systems, including avionics, autopilot, landing gear, and trim using realistic controls. The system—optimized for use with Microsoft Flight Simulator, Fly! II, and X-Plane—is modular; you can install any combination of control panels for a custom configuration.

"We have a pretty wide variety of customers. Retired airline captains are some of our biggest users, and we have some people who have never flown an airplane," says Doyle Nickless, GoFlight president. According to Nickless, most customers use four or five modules, each of which requires a USB port. The company sells enclosures in three sizes, including a full-height rack that holds as many as seven modules, a smaller rack for two, and a huge "flightdeck console" that holds 14.

I Have The Power

Even if the only software you fly is a Web browser, you can still have a sexy flight control at your disposal. The PowerMate from Griffin Technology (\$45; www.griffintech.com) is a unique input device that can be useful no matter what software you use. In short, it's a shiny silver knob that connects to a USB port on your PC or Mac.

Use the configuration software to tell the PowerMate how to control various applications. For example, it can control the volume in your MP3 app, scroll up and down in your Web browser, act as a jog wheel in your video-editing program, or deftly move the paddle around for a game of Pong. In addition to rotating the knob, pressing down on it can perform



Tempest on a vector monitor controlled by a PC.

mouse clicks or other actions. The knob is heavy and weighted well and can be a more comfortable way to scroll than using your mouse's scroll wheel.

Even if it didn't do anything, the PowerMate would be worth its price for its glowing blue base, which can emit an eerie, steady glow or pulse at a user-defined rate.

Vector Invader

After loading your computer with all these unusual input devices, here's an unusual output device to consider: a vector monitor. The Zektor Vector Generator (www.zeckor.com) is a \$299 card that lets your PC drive a vector display.

(A quick review: A raster monitor creates an image by illuminating rows of dots, doing so whether or not there's anything to see at that portion of the image. Your television set and computer monitor are raster displays. A vector monitor, also known as an X/Y monitor, draws just a few lines, only where the image is. Remember Asteroids? It used a vector display.)

The ZVG connects between a PC's parallel port and the analog X/Y inputs of the vector monitor. The card bundles the cables you need—just add a monitor. Salvaging a monitor from an old arcade game or searching eBay are the easiest ways to get one. The card can drive nearly every vector monitor made in color or monochrome.

Those using it are primarily classic video game players who want the unique look of vector graphics on emulated games. "There are a lot of enthusiasts out there who haven't had their fix of vector graphics in awhile," says Bill Paul, Zektor co-founder.

The creators of Retrocade, an arcade game emulator (www.retrogames.com/retrocade.html), have created a version that drives the ZVG card, so you can play Tempest, Lunar Lander, and other vector games. Support for MAME (www.mame.net) should come shortly, as Zektor has released the drivers as open source and will be releasing a full API for programmers.

"Quite a few people have expressed interest in developing all new games. Since we're going to have the full API available, this will allow people to write PC games that are vector-graphics-based. We're hoping to see a kind of vector graphics retro revolution," says Paul. 🎮

by Kevin Savetz

Infinite Loop

:-) Runs Longer Than Cats!

Twenty years ago, Scott Fahlman, an IBM researcher, gave birth to :-), the first emoticon. If Fahlman and other early emoticon adopters had sent :-), through postal mail rather than email and newsgroups, it would have cost just one 20-cent stamp. Other events from the year of :-)'s birth: *USA Today* launches, "Cheers" and "Late Night With David Letterman" first appear on television, the first users play the new game TRIVIAL PURSUIT, surgeons perform the world's first permanent artificial heart surgery, and the long-running Broadway musical "Cats" premieres.



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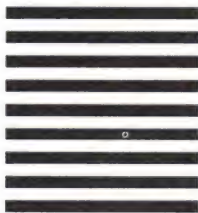
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Technically Speaking

An Interview With Jaron Lanier, Virtual Reality Pioneer

When asked the title he prefers, Jaron Lanier emphatically replied, "Human." This might seem odd coming from the 42-year-old man who coined the term "virtual reality" and pioneered the field during the late '80s and early '90s. However, the man who has done so much to create computer-generated environments is even more firmly rooted in the problems and pleasures of the physical world. Lanier is an accomplished musician and composer, author, and visual artist, not to mention an outspoken philosopher and critic on society and technology.

Today, Lanier is the lead scientist in the National Tele-Immersion initiative, an effort aimed at using multiple cameras and massive amounts of bandwidth to create a sort of 3D videoconferencing environment in which computer-generated objects appear to float in space and multiple remote users can interact with these objects and each other in real-time. The effect is a bit like the holographic projection depicted in "Minority Report," for which Lanier was one of only two computer experts Spielberg consulted. ▲

by William Van Winkle

CPU: What was your role in the development of VR?

Lanier: About 21 years ago, I was working on various things related to exotic user interfaces and I came up with the name "virtual reality." Originally, it was in response to another term that was floating around, which was "virtual world." That had been coined by a guy named Ivan Sutherland, who is the father of computer graphics. The difference between virtual reality and virtual world was that in virtual reality there could be multiple people involved at the same time instead of just you and the world. There would be a shared world, which seemed like reality.

I did a lot of work on gadgetry to make this possible, such as things that you wear, as well as the software. I ended up with this little company called VPL, which was the first company to

sell virtual reality stuff. I didn't intend to get into the business, but it just sort of happened. I've done a lot of stuff in studying human beings using virtual reality as the tool for studying how we perceive and how we think. And I've ended up doing a lot of work on applications of it—for instance, figuring out how you'd use it to design a car, explore an oil field virtually, or assist a surgeon.

CPU: You were the one who made virtual space a shared environment. As such, how do you think VR will impact the future of interpersonal communications?

Lanier: There are two levels in which virtual reality will have an effect on people. One is sort of the more prosaic one in which it will reduce the effects of

distance, very much as the telephone did a century ago. I hope virtual reality will increase the ability of people to form relationships at a distance and maintain them. That seems exceptionally important to me given the way our society is going, where it's very hard for us to remain in the same places with the people we love. I'm hoping this will help.

The more ambitious and speculative way it might help people is as follows: I think every child sort of faces a trauma when he or she realizes that you have to give up some of your imagination in order to be with other people. Inside



your head, if you're just by yourself, you can imagine anything and it's as if it's real. But if you want to stay connected to other people, you have to stay in the real world where things are much more limited. So you have to make a tradeoff when you accept this kind of weakness and boredom in order not to be lonely. This just sucks! What a horrible tradeoff you have to make.

What I'm hoping is that inside virtual worlds, eventually, people can both have the power and excitement of imagination while also being connected with other people because the virtual world is really shared with the real world, even though you make it up. I suppose you could say that this might resolve some of the dilemmas of becoming an adult. That's the other thing I hope we can do.

CPU: Since the popularization of the Web, many people have touted the eventual benefits of "intelligent agents," yet you think this idea is dangerous. Why?

Lanier: The problem is that there isn't any meter that you can stick on a machine to tell if it's intelligent or not. From the very origin of the idea of machine intelligence with Alan Turing, he didn't propose that you could ever have some kind of measurement that would tell you if something's intelligent. Rather he suggested a sort of a game where if a person was willing to believe a machine was intelligent, then it might as well be. But the problem with that is that people can believe a lot of things.

A lot of people believe their dogs are more intelligent than they really are, for instance. Now, if somebody can believe their dog is more intelligent than the dog really is, they surely can also believe their computer is more intelligent than it really is. If it's with a dog, the results are harmless. If it's with a computer, the results could be harmful because we use computers for practical things. Time and time again we see organizations become less effective because they believe the computer is doing more than it really is.

Instead of thinking of systems as being intelligent, we can instead say we'll try and make them more and more effective by designing better and better user interfaces so people can understand them. When Microsoft designed Word, they put in this so-called intelligent feature where it tries to figure out what you meant to type and then it'll retype for you, set your margins, and all this. What happens in practice is it doesn't really know what somebody wants, and very frequently its guess is wrong. But people have learned to type around it subconsciously. The software has trained people basically to type in a different way in order to get the results they want. The result is that the people are actually putting in more work than they used to because it's complicated to type around something, and they have to go through this learning process without it ever being spelled out for them. So it's actually made people less efficient, but that loss of efficiency is sort of hidden because of this fantasy that it's "alive."

CPU: Your article on tele-immersion in the April 2001 issue of *Scientific American* describes the use of seven cameras and eight 2GHz Pentium 4 processors to create a shareable virtual 3D world translated from physical reality in real-time. The bandwidth you state for just 2 frames per second is 20 to 80Mbps, or 10 to 40 times what I can pull in over my cable modem. Still, you say that the technology should be in common use in about 10 years. Do you still stand by that?

Lanier: Yeah, I think so, although it's easier to see what will happen eventually than to get the year. A lot of it really is the economics, not technology. See, the telecommunications industry over-invested in infrastructure based on the applications that are in use today. So if nobody comes up with another application that needs more bandwidth, it'll turn out that they've over-invested and

so they'll be stuck with all this infrastructure that nobody's using. On the other hand, it still isn't enough bandwidth for tele-immersion. If it had turned out that they had over-invested even more, so there was enough for tele-immersion, then tele-immersion would happen sooner and save the day by creating the demand for the stuff they've invested in. But right now, I'm sort of afraid that the telecommunications industry is in this in-between spot where they've invested in more capacity than is needed by the current generation of applications, but not enough to support what will be needed by the next generation. We're in this unfortunate in-between state, so it actually could take longer to sort things out.

If there was the financing available today, we could have tele-immersion a lot sooner, and I believe that the demand would also be there. But it's a big leap of faith to take, and it certainly isn't the highest priority given everything else going on in the world. Still, I think it's still a reasonable guess.

CPU: Because we're on the phone, we don't have to worry that we're in grubby T-shirts and our hair is a mess. But in a world of widespread tele-immersion, how do you think social conventions and expectations will change?

Lanier: We've done some experiments with being able to filter people. For instance, you could appear with your authentic expressions and emotions but have your clothing changed or your hair changed. There aren't published studies on these particular questions, but given the informal observations I can report so far, the issues will apparently be more important to women than to men. And I'm sure, just as we were saying before that augmented reality will be just be part of virtual reality, that self-filtering will be one essential part of tele-immersion. 

To read our entire interview with Jaron Lanier, go to
www.cpumag.com/cpudec02/lanier

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Under Development

A Peek At What's Brewing In The Laboratory

Fresh from the most influential R&D labs around the world, here's a glimpse at some of the technology that scientists, lab techs, and researchers are cooking up for the future.

Carrying Tomorrow's Load

In the early 20th century, the newly created telephone network required live operators to manually connect calls. It soon became apparent that network traffic would swamp any amount of human operator control, so the network was automated. The situation is analogous to today's Internet server network. Sure, servers feature load balancing, redundancy,

and more, but the explosion of Internet-based connections happening now will result in trillions of transactions per second by 2005, according to IBM's Greg Burke. That traffic amount would crush today's ebusiness infrastructure, no matter how many machines were devoted to it.

To head off the problem before it arrives, IBM has developed Project eLiza, aimed to develop self-managing networks that essentially remove humans from the critical network maintenance processes that must be carried out on an instant's notice. eLiza seeks to address four key areas: self-configuring, self-healing, self-protecting, and self-optimizing.

Self-configuring refers to adding software and devices to a system with an absolute minimum of user intervention. Self-healing goes beyond insulating the system from crashing applications to working to find system resource holes and performance delays so problems are automatically fixed before they become critical. Self-protection and self-optimization refer to automatically managing user access and maximizing the

system's performance. Imagine almost never having to tweak a firewall or defrag a hard drive again.

IBM describes Project eLiza as a way "to make your ebusiness infrastructure an autonomous, self-managing system." Autonomous computing is often seen as necessary to bring about the concept of "grid computing," wherein vast numbers of computers are linked and able to share resources. For example, universities could order the computing power necessary to crunch a major project from the grid rather than investing in on-site supercomputers. However, much of the attention devoted to eLiza and various incarnations tends to focus on hardware. Equally important in the long run is self-managing software.

Some pieces of the eLiza puzzle are already in place (most IBM eserver machines are touted as having embedded eLiza technology) while many others are still under development, particularly those involving software management. Candle Corporation is a key IBM eLiza developer focused on the software side.

"The long-term issue is, once I've got my server self-managing, how do I get my applications self-managing?" asks Pete Marshall, Candle's assistant vice president of systems management. "The vision is a provisional piece of software that you never touch again. It self-heals; it restarts if something fails. It moves loads from place to place. But beyond that then is the issue of how I manage applications across a very large area. That's where we're researching right now. Grid computing is great, but once you get there, your toaster can still blow up when you plug it in, so to speak. This huge network's software has to be able to adapt to that."

The march toward a fully autonomous network may not come this decade or even the next. Most current eLiza solutions work to keep admins informed of problems before they become crises, but the long-range goal is to make humans altogether optional to the maintenance and optimization process. If the computer industry can figure out how to make large-scale server networks autonomous, then perhaps other networks, such as automobiles on the highway, will follow soon after. ▲



IBM executives Dev Mukherjee and David Turek examine a computing grid model that will enable scientists and researchers throughout the United Kingdom to access computing power, applications, and data as a utility-like service over the Internet. The technologies behind Project eLiza are essential for enabling the wide-flung hardware resources involved with grid computing.

Moore's Law Moved Back?

You probably know that Moore's Law states the number of transistors that can fit on a chip die doubles approximately every 18 months. This increase in circuitry is usually achieved through shrinking the individual on-die features. Today, transistors on a Pentium 4 chip

"The two-dimensional planar transistor design hasn't really changed since the start of the semiconductor industry 40 years ago," says Kevin Teixeira, Intel spokesman. "But with tri-gate, you now have three times the area for current to flow through. More power means it will run faster, plus it'll leak less power so chips run cooler. We can get down to the small feature sizes and keep controlling power, which means we can keep holding off [the end of] Moore's Law."

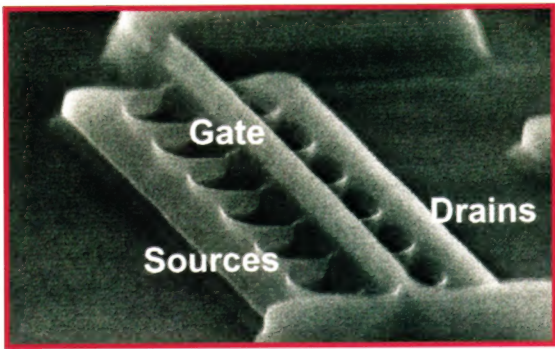
Intel describes the tri-gate transistor as looking like a raised, flat plateau with vertical sides. Rather than only passing current across the transistor's top plane, a tri-gate can pass current along the top and both vertical sides. Because tri-gates can run more current through the

same amount of chip real estate, they run faster than their planar counterparts and can scale down in size just as well. Current test units have already reached 60nm on the same fab process used to make Pentium 4 chips.

The tri-gate design is compatible with Intel's next-generation TeraHertz transistor architecture (see March 2002 *CPU*, page 44) and, if proven suitable for mass production, it's expected to begin appearing in processors in the latter part of this decade. ▲

can measure only 60nm across, although 20nm and 30nm transistors have been developed in numerous labs.

Unfortunately, beyond 30nm, transistors begin to experience significant current leakage, even when in off states. To compensate for this, more power must be pushed through the circuits, but this in turn generates unacceptable heat levels. Many corporate and academic labs are working on solutions for this, but Intel thinks it may have a feasible answer now: the tri-gate transistor.



Gate
Drains
Sources

Intel's tri-gate transistor design moves from today's flat, or planar, transistors to a 3D design able to pass far more current, ultimately yielding higher processor speeds with significantly less heat loss.



Ditching Photolithography

The process of creating silicon microprocessors is a horrendously expensive one. For decades, chips have been manufactured by beaming a pattern of light onto a silicon wafer coated with photosensitive material. Like film, this material becomes exposed, and the pattern imprinted on the wafer is etched with acid. The pattern becomes a network of pits and grooves that are then filled in with transistors, wires, and other features before being covered with another layer of semiconductor material, whereupon the process is repeated with a new pattern. This process is called photolithography.

The pattern masks, lasers, and optics composing today's photolithographic process are increasingly difficult to create and control as chip feature sizes shrink. The process also takes 10 to 20 minutes per chip.

At Princeton University, electrical engineer Stephen Chou has devised a revolutionary alternative that can create features measuring only 10nm, thus increasing the a transistor's density a hundred-fold over today's technologies. The process, which Chou calls LADI (Laser-Assisted Direct Imprint), entails creating a feature mold out of etched quartz. The mold is pressed against the silicon substrate, then an ultraviolet laser fires through the quartz for 20-billionths of a second. The silicon's surface briefly melts and reforms around the mold. When the mold is removed, the silicon is ready to receive metal features.

"People's intuition is that mechanical processes are very slow, so imprinting cannot be fast," Chou has stated. "But I knew there is no scientific proof of that. . . . Here you do not need all of those [photolithography] steps. You just imprint the pattern directly onto the silicon. You not only reduce the number of steps, you can do it in nanoseconds."

Chou's process would also prove more environmentally friendly. Semiconductor fab facilities have a record of polluting groundwater supplies with acids and other toxic substances. LADI wouldn't eliminate using toxic chemicals, but it would help. Chou hasn't said when LADI might be commercialized. One Stanford expert stated in the same *Nature* issue that Chou's process was described in that LADI could extend Moore's Law by 20 years if successful. ▲

The Silence Of The Cell Phones

Have you ever sat enthralled by the unfolding climax of a play or movie only to have the moment shattered by the ring of some imbecile's cell phone? Such public interruptions may soon come to an end. Hideo Oka and a team of engineers at Iwate University in Japan have hit on a fairly simple solution to intruding cell phone signals: use special electromagnetic wave-blocking wood to jam the signal.

Specifically, Oka uses a 4mm-thick layer of nickel-zinc ferrite sandwiched between two wooden planks. Theaters and restaurants paneled in the special wood would effectively be a dead zone to radio waves. Such paneling might also be in high demand from businesses worried about hackers snooping on their Wi-Fi networks, as well as homes looking to block outside neighborhood interference from their WLANs.

Although Oka hasn't given an estimate on when a commercial product might be available, he anticipates it being affordable enough for popular use, especially if the boards are made with recycled materials. ▲

Back Door

Q&A With Mark Cuban

It seems like everything Mark Cuban touches turns to gold. The business-savvy Cuban founded MicroSolutions in the early 1980s and sold it to CompuServe several years later. He then started AudioNet—later Broadcast.com—and sold it to Yahoo! in 1999 for billions. After leaving Yahoo!, Cuban purchased the NBA's Dallas Mavericks. Under his leadership, the Mavs have morphed from an also-ran team to a playoff participant. Cuban, who has become well known as professional sports' most fan-friendly and outspoken owner, spoke to *CPU* on technology, the NBA, and more.

Q Let's focus first on your pre-NBA days. When you started AudioNet in 1995, later becoming Broadcast.com, did you hope another company would offer you a lucrative acquisition at some point or did you plan to run Broadcast.com for 15 or 20 years?

CUBAN: No, when we started there was no Internet stock boom. Bankers told us to get profitable before we even thought of going public. In my first company, I had never had a losing month, let alone a year, so at AudioNet, we focused on sales. I would walk around the office yelling at people that it was "selling time." If I saw two salespeople talking to each other, I would get mad because no one was going to buy anything. We had a real focus on sales at AudioNet/Broadcast.com, and our focus was pure profitability from the day we started.

Q When you started AudioNet, what sold you on the idea of audio and video programming on the Web actually being successful? Did you have any idea early on just how successful the idea would become?

CUBAN: I bought a Gandalf ISDN bridge, a Packard Bell 386, a connection to the 'Net, and set up a Netscape server to get AudioNet rolling. We put up audio in Xing [and] Progressive Networks Real



formats, and then I would go to forums and chat rooms on CompuServe, AOL, and the 'Net and tell people to check out our site and email me with their thoughts. The response was amazing, so we decided we might have something that could work. What made it click and turn into a business was when we started broadcasting business events. We realized early on that what we sold was real-time communications: Companies communicating with customers, shareholders, employees, whoever. We could do it cheaper, faster, and better than existing means. The response to this—and the willingness of companies to pay for it—made us very confident. All of the sports radio was just a proof of concept so that people could experience the technology in a way they understood.

Q Near the time of the acquisition, you said one of the reasons you chose to sell Broadcast.com to Yahoo! was because Yahoo! management had similar goals to your goals. A few years later, has Yahoo! continued to run Broadcast.com, which has become Yahoo! Broadcast, as you thought it should be run? Would you like to see Yahoo! do anything differently with Yahoo! Broadcast?

CUBAN: They messed it up bad. Yahoo! was nowhere near as aggressive as I thought they were. Everything was about consensus. Getting 20 people to agree took more time than selling, and to me, that was the start of

the end. I was getting nothing done, and neither was our group. So I left, and—pretty much—Yahoo! left Broadcast to die. [Cuban worked with Yahoo! Broadcast for several months after the acquisition before leaving the company.]

Q You also started MicroSolutions in the early 1980s before selling it to CompuServe. Would it be correct to say you didn't have much knowledge about computers before starting the company? What were some of the best lessons you learned at MicroSolutions?

CUBAN: Everything I do in business, I learned at MicroSolutions. I learned that there is always someone out there to kick your a**, so you never let up. Ever. [I learned] that your product has to be compelling and differentiated. You couldn't just say it was; it had to ring true to your customers. I learned that most people had big ideas but little ability to execute. In particular, they couldn't sell, and that would be the key to survival. "Sales cures all" remains a key mantra. I learned that if you didn't pre-empt your competitors, they would do it to you.

Q You've been involved in developing several cool technologies, you made billions in the high-tech industry—and you kept it—and now you own an NBA team, the Dallas Mavericks. Can you imagine your professional life going any better than it has thus far?

CUBAN: Nope. Just don't pinch me when you see me.

For our full interview with Mark Cuban, see www.cpumag.com/cpudec02/cuban.

Kyle Schurman has been writing about computers and the computing industry for Smart Computing and CPU magazines for nearly 10 years.



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